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Study of Emissions from Light Duty Vehicles in San Antonio, Texas

EG and G Automotive Research, Inc.
San Antonio, TX

Prepared for

Environmental Protection Agency, Ann Arbor, MI

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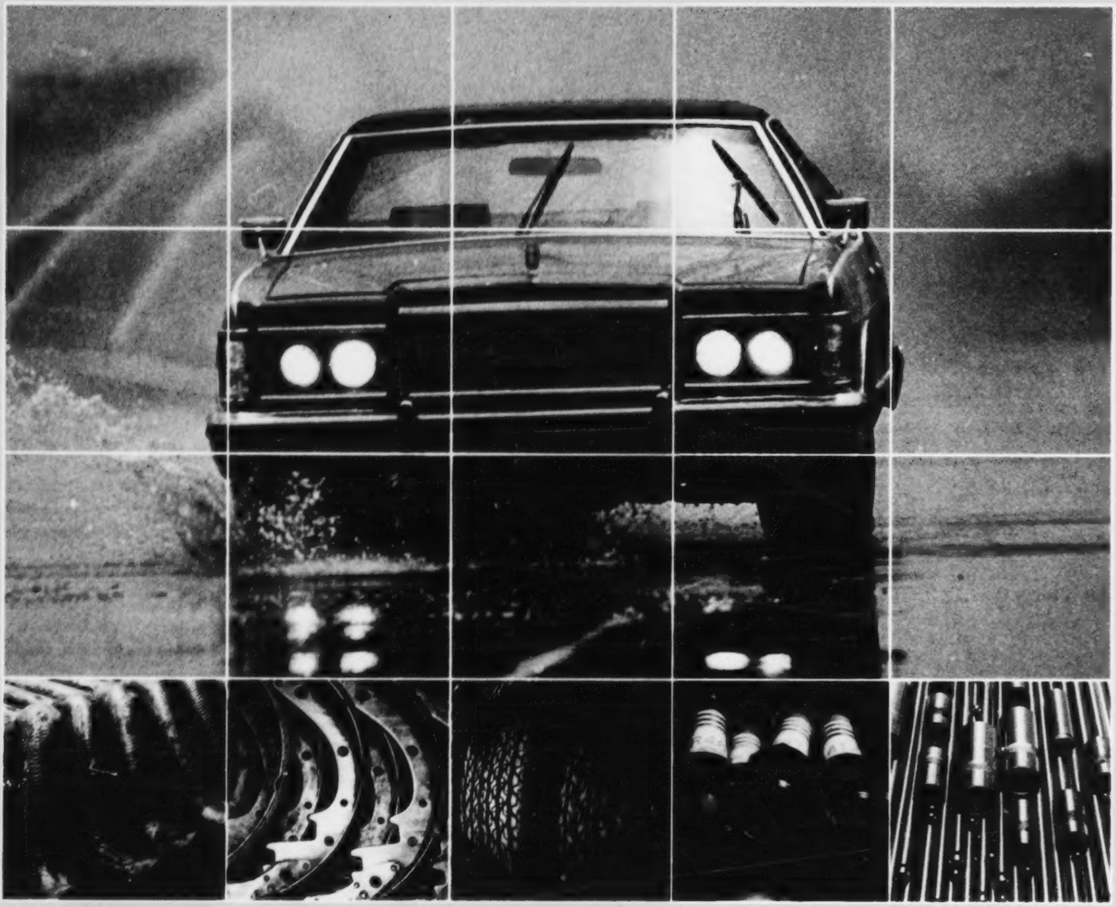

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Three hundred 1978 through 1981 in-use light duty vehicles were obtained from the public, in the San Antonio Metropolitan Area. These vehicles were tested as received, for exhaust emissions utilizing the Federal Test Procedure, the Highway Fuel Economy Test, and four short mode tests. All vehicles were subjected to a thorough emissions control component inspection. Fifty vehicles which failed to meet applicable standards, received maintenance and a retest.

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A Study of Emissions from Light Duty Vehicles in San Antonio, Texas

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This report was furnished to the Environmental Protection Agency by EG&G Automotive Research, San Antonio, Texas in fulfillment of Contract No. 68-03-3024. The contents of this report are reproduced herein as received from EG&G Automotive Research, San Antonio, Texas. The opinions, findings, and conclusions expressed are those of the author and not necessarily those of the Environmental Protection Agency. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

ABSTRACT

Three hundred 1978 through 1981 in-use light duty vehicles were obtained from the public, in the San Antonio Metropolitan Area. These vehicles were tested, as received, for exhaust emissions utilizing the Federal Test Procedure, the Highway Fuel Economy Test, and four short mode tests. All vehicles were subjected to a thorough emissions control component inspection. Fifty vehicles which failed to meet applicable standards received maintenance and a retest.

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SECTION I

BACKGROUND

The United States Environmental Protection Agency (EPA) has the authority under the provisions of the Clean Air Act to develop, implement, and administer programs designed to quantify and reduce the pollution of the nation's resources. Authority in part for this objective is assigned to EPA's Emission Control Technology Division (ECTD). ECTD is responsible for assessing, quantifying and ultimately reducing air pollution from in-use motor vehicle sources. One of the major test projects that is utilized to attain this goal is the Emissions Factor (EF) Program.

The first EF Program was conducted in EPA's Fiscal Year (FY) 1971. Subsequent Programs were conducted in FY's 1972, 1973, 1974, 1975, 1977 and 1979. The programs conducted in FY's 1975 and 1977 were extended to include the following year. These EF Programs were specifically designed to obtain exhaust emissions data from in-use vehicles operated in a wide range of topographical and climatogical conditions. During the course of EF Programs, vehicles located in the following U.S. cities have been tested: Chicago, Houston, San Antonio, Denver, Los Angeles, Detroit, Phoenix, St. Louis and Washington, D.C.

The number of model years, number of vehicles to be tested, and any other specific vehicle requirements for each EF Program was established by ECTD. Some of the factors which affected the vehicle requirements were, sales percentages by manufacturer for each model year, changes in emissions standards, advancements in emission control technology and revisions in Federal Testing Procedures.

In the recent EF Programs special short mode testing procedures have been incorporated. These short mode tests are designed to correlate with the more extensive certification tests. These methods are under consideration for use by state governments in vehicle emissions inspection and maintenance programs.

The portion of the FY 1980 Emission Factor Study which was conducted in San Antonio, Texas, is the subject of this report. In order to accomplish this study EPA contracted EG&G Automotive Research, Inc. (EG&G-AR) to provide data on vehicles operated in the San Antonio metropolitan area.

SECTION II

INTRODUCTION

In September of 1980, EG&G Automotive Research, Inc. was awarded a contract to procure and test three hundred vehicles in the San Antonio area. Model year 1978 through 1981 vehicles were procured from registration listings. In accordance with the contract terms a limited number of 1981 vehicles were obtained through car rental agencies. Only light duty, gasoline powered vehicles were included in the program. The contract period was from September 1980 to July 1981.

All three hundred vehicles were tested as received. The test sequence consisted of the FTP emissions test, Highway Fuel Economy Test and four short cycle tests. After the test sequence, each vehicle received an extensive inspection of emission-related components and adjustments.

The first fifty vehicles that exhibited high exhaust emissions levels received a restorative maintenance procedure, followed by an additional test sequence. After validation of the test results, each vehicle was returned to the owner along with the participation incentives.

All test data was supplied to either the Project Officer or the EPA's data contractor, with calibration and maintenance data supplied to the Project Officer on a weekly basis.

This program is detailed in Sections III through VII.

- Section III contains a brief narrative of the procurement methods utilized. It also includes a summary of the procurement activity.
- Section IV outlines the methods and procedures used in vehicle preparation, inspection and maintenance.
- Section V describes the emission testing equipment that was used. It also explains calibration procedures. A brief description of the different testing modes is also found in this section.
- Section VI is an explanation of how test results were processed.
- Section VII explains the process that was used in auditing and transmitting test results and equipment calibration data.

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SECTION III

PROCUREMENT OF VEHICLES

A. PROCUREMENT METHODS

The EPA supplied a list of three hundred vehicles to be procured and tested. This list is found in Table III-1. Substitutions were made by the EPA for some models that were unavailable. Table III-2 lists these substitutions and the reasons why they were made.

Total requirements by model year were as follows:

MODEL YEAR		NUMBER OF VEHICLES
1978		25
1979		25
1980		100
1981		150
	TOTAL	300

Each of the model year lists specified the vehicle number, number of units required, make, model, and in some cases engine size. Individual vehicle requirements for each model year were based on sales volumes for that year.

The Wilson Publishing Company in Houston, Texas was contracted to supply vehicle registration lists for all the required year models. Registration listings were limited by U.S. Postal codes for the immediate San Antonio metropolitan area.

A random number table was used to randomize the registration listing for the 1978, 1979 and 1980 model years. The list for the 1981 model year which was supplied later, was randomized prior to printing by the Wilson Publishing Company.

Procurement mailings were then made from these randomized lists. The mailing consisted of an EPA supplied letter briefly describing the project, a list of normally asked questions and answers and a reply card. Positive response cards were followed up with telephone interviews. Appendix A contains copies of all of the forms and documents that were utilized in the procurement process.

Each of the procurement mailings were recorded in the Sample Vehicle Control Logs. These logs were supplied by EPA and used for tracking each vehicle from initial solicitation to the conclusion of the procurement process.

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ORIGINAL VEHICLE REQUIREMENTS

FY80 Emission Factor Program

1981 Model Year

Veh. No.	Quantity	Make	Model
001-007	7	Chev	Chevette
008-014	7	Chev	Citation-four 4-cylinder, three V-6
015-019	5	Chev	Malibu-three V-6, two V-8
020-022	3	Chev	Cavalier
023-024	2	Chev	Camaro
025-026	2	Chev	Impala/Caprice
027	1	Chev	Monte Carlo
028-034	7	Olds	Cutlass/Supreme-four V-6, three V-8
035-037	3	Olds	88/98
038-040	3	Olds	Omega-two 4-cylinder, one V-6
041-044	4	Buick	Skylark-two 4-cylinder, two V-6
045-049	5	Buick	Regal/Century-three V-6, two V-8
050-051	2	Buick	LeSabre/Electra
052-054	3	Pontiac	Phoenix-two 4-cylinder, one V-6
055	1	Pontiac	Firebird
056-057	2	Pontiac	Grand Prix
058-059	2	Pontiac	Catalina/Bonneville
060	1	Pontiac	LeMans
061	1	Pontiac	"J-Car"
062-063	2	Cadillac	DeVille, Fleetwood
064	1	Cadillac	Eldorado or Seville (non-diesel)
065-069	5	Ford	Escort
070-073	4	Ford	Fairmont
074-077	4	Ford	Mustang
078-079	2	Ford	Thunderbird
080	1	Ford	Granada
081-082	2	Mercury	Lynx
083-084	2	Mercury	Zephyr
085	1	Mercury	Capri
086	1	Mercury	Marquis
087-088	2	Plymouth	Reliant
089-090	2	Plymouth	Horizon
091-092	2	Dodge	Aries
093-094	2	Dodge	Omni
095-096	2	Chrysler	LeBaron/Cordoba
097-099	3	Volkswagen of America	Rabbit
100-101	2	AMC	Concord/Spirit
102-104	3	Toyota	Corolla
105-107	3	Toyota	Tercel
108-109	2	Toyota	Celica
110	1	Toyota	Corona
111-113	3	Datsun	210
114-115	2	Datsun	310
116-117	2	Datsun	510

TABLE III-1
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Figure III-1 is a Vehicle Procurement Flow Chart which shows the procurement method that was utilized. This flow chart reflects the 1981 year model requirements for percentage of high mileages, number of rental vehicles, etc. The same sequence of events applies for all year models.

B. SUMMARY OF RESULTS

Of the three hundred vehicles procured, 268 (89%) were obtained in accordance with the prescribed random method. The remaining 32 (11%) vehicles were procured using alternate methods that were either specified in the contract or specifically approved by the EPA. The methods included rentals (1981 models only), EG&G-AR employee owned vehicles, leased vehicles, etc. Table III-3 lists these vehicles and shows the alternate methods that were utilized.

In order to obtain the 268 vehicles that were procured from the randomized listings, a total of 1,665 procurement packets were mailed.

ORIGINAL VEHICLE REQUIREMENTS

FY80 Emission Factor Program

1980 Model Year

Veh. No.	Quantity	Make	Model
151-154	4	Chev	Chevette
155-156	2	Chev	Monza
157-161	5	Chev	Citation-three 4-cylinder, two V-6
162	1	Chev	Camaro
163-165	3	Chev	Malibu
166-167	2	Chev	Monte Carlo
168-170	3	Chev	Impala/Caprice
171	1	Olds	Omega
172-176	5	Olds	Cutlass/Supreme-three V-6, two V-8
177-178	2	Olds	88/98
179-180	2	Buick	Skylark
181-182	2	Buick	Century
183-184	2	Buick	Regal
185	1	Buick	LeSabre
186	1	Pontiac	Sunbird
187	1	Pontiac	Phoenix
188	1	Pontiac	Firebird/LeMans
189	1	Pontiac	Grand Prix
190	1	Pontiac	Catalina/Bonneville
191	1	Cadillac	Any model
192	1	Ford	Pinto
193-195	3	Ford	Mustang
196-198	3	Ford	Fairmont
199	1	Ford	Granada
200	1	Ford	Thunderbird
201	1	Ford	LTD
202-203	2	Mercury	Zephyr
204	1	Mercury	Capri
205	1	Lincoln	Continental/Mark VI
206-207	2	Plymouth	Horizon
208	1	Plymouth	Volare
209	1	Chrysler	Cordoba/LeBaron
210	1	Dodge	Omni
211	1	Dodge	Aspen
212-213	2	Volkswagen of America	Rabbit
214-215	2	AMC	Concord/Spirit
216-217	2	Toyota	Corolla
218-219	2	Toyota	Tercel
220	1	Toyota	Celica
221-222	2	Datsun	210
223-224	2	Datsun	310
225	1	Datsun	510
226-227	2	Honda	Civic
228-229	2	Honda	Accord

TABLE III-1
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ORIGINAL VEHICLE REQUIREMENTS

FY80 Emission Factor Program

1981 Model Year

Veh. No.	Quantity	Make	Model
118	1	Datsun	200SX/280ZX
119-121	3	Honda	Civic
122-123	2	Honda	Accord
124-125	2	Mazda	GLC/626/RX-7
126-127	2	Mitsubishi	Colt/Arrow
128-129	2	Subaru	Any model except "Brat"
130-131	2	Volkswagen	Dasher
132	1	Ford	Fiesta
133	1	Fiat	Strada/Brava
134	1	Volvo	Any model
135	1	Audi	Any model
136-140	5	Chev/GMC	P/U
141-145	5	Ford	P/U
146-148	3	Dodge	P/U
149	1	Datsun	P/U
150	1	Toyota	P/U

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ORIGINAL VEHICLE REQUIREMENTS

FY80 Emission Factor Program

1979 Model Year

Veh. No.	Quantity	Make	Model
251	1	Chev	Chevette
252	1	Chev	Monza
253	1	Chev	Malibu
254	1	Chev	Camaro
255	1	Olds	Cutlass/Supreme
256	1	Olds	88/98
257	1	Buick	Regal/Century
258	1	Pontiac	Sunbird/Phoenix
259	1	Pontiac	Firebird/Grand Prix
260	1	Ford	Mustang
261	1	Ford	Fairmont
262	1	Ford	LTD/Thunderbird
263	1	Mercury	Monarch
264	1	Dodge	Omni
265	1	Plymouth	Horizon
266	1	Datsun	B210
267	1	Datsun	510/280Z
268	1	Toyota	Corona/Corolla
269	1	Toyota	Celica/Cressida
270	1	Volkswagen	Rabbit
271	1	Honda	Civic/Accord
272	1	Mazda	GLC/626/RX7
273	1	Chev	P/U
274	1	Ford	P/U
275	1	Dodge	P/U

TABLE III-1
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ORIGINAL VEHICLE REQUIREMENTS

FY80 Emissions Factor Program

1980 Model Year

Veh. No.	Quantity	Make	Model
230	1	Mazda	GLC
231	1	Mazda	626
232-233	2	Subaru	Any model except "Brat"
234-235	2	Volkswagen	Dasher
236-237	2	Mitsubishi	Colt/Arrow
238	1	Volvo	Any model
239	1	Ford	Fiesta
240	1	Mercedes Benz	Any model
241-244	4	Chev/GMC	P/U
245-246	2	Ford	P/U
247-248	2	Toyota	P/U
249	1	Dodge	P/U
250	1	Datsun	P/U

TABLE III-1
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VEHICLE SUBSTITUTIONS

ORIGINAL REQUIREMENTS					SUBSTITUTIONS					
Veh. No.	No. of Veh.	Year	Make/Model	Engine	Veh. No.	No. of Veh.	Year	Make/Model	Engine	Reason
132	1	1981	Ford/Fiesta	Any	132	1	1982	Merc/LN7	Any	1980 was the last production year for the Ford Fiesta.
133	1	1981	Fiat/Strada Brava	Any	133	1	1982	Ford/EXP	Any	Registration list supplier could not locate 1981 vehicle
*130	1	1981	Volks/Dasher	Any/ gasoline	130	1	1982	Ford-Merc/ EXP-LN7	Any	Registration list supplier an local dealer stated that the 1981 VW Dasher is available with diesel engines only.
*097-099	3	1981	Volks/ Rabbit	Any/ gasoline	097-099	3	1982	Ford/Merc/ EXP-LN7	Any	All registration of 1981 VW were used with no positive responses.
063	1	1981	Cadillac/ DeVille	Any	063	1	1981	Cadillac/ Eldorado	Any	Could not obtain required model. Substitution approved by the Project Officer.
157	1	1980	Chev/ Citation	V-6	157	1	1980	Chev/ Citation	4-Cyl	Contract allows that 10% (30 vehicles) of the vehicles do not have to be an exact match for engine displacement.
103	1	1981	Toyota/ Corolla	Any	103	1	1981	Toyota/ Tercel	Any	Could not obtain required model. Substitution approved by the Project Officer.
127	1	1981	Mitsubishi/ Arrow	Any	127	1	1981	Dodge/ Aries	Any	Could not obtain required model. Substitution approved by the Project Officer.
*131	1	1981	Volks/Dasher	Any gasoline	131	1	1982	Merc/LN7	Any	Could not obtain required model. Substitution approved by the Project Officer

*All available registration listings for 1981 Volkswagens were solicited, but the majority of positive responses were diesel powered units. Attempts to obtain these vehicles through local dealers and other sources were unsuccessful.

TABLE III-2

ORIGINAL VEHICLE REQUIREMENTS

FY80 Emission Factor Program

1978 Model Year

Veh. No.	Quantity	Make	Model
276	1	Chev	Chevette
277	1	Chev	Monza
278	1	Chev	Camaro
279	1	Chev	Malibu
280	1	Chev	Monte Carlo
281	1	Olds	Cutlass/Supreme
282	1	Olds	88/98
283	1	Buick	Regal/Century
284	1	Pontiac	Sunbird
285	1	Pontiac	LeMans/Firebird
286	1	Ford	Pinto
287	1	Ford	Mustang
288	1	Ford	Fairmont
289	1	Ford	Granada
290	1	Mercury	Zephyr
291	1	Dodge	Aspen
292	1	Plymouth	Horizon
293	1	Datsun	B210
294	1	Datsun	510
295	1	Toyota	Corona/Corolla
296	1	Toyota	Celica
297	1	Volkswagen	Rabbit
298	1	Honda	Accord
299	1	Chev	P/U
300	1	Ford	P/U

TABLE III-1
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VEHICLES OBTAINED BY ALTERNATE PROCUREMENT METHODS

Veh.No.	Year	Make/Model	Alternate Method	Reason
020	1982	Chev/Cavalier	Rental	Per terms of contract
021	1982	Chev/Cavalier	Rental	Per terms of contract
022	1982	Chev/Cavalier	Rental	Per terms of contract
032	1981	Olds/Cutlass	Rental	Per terms of contract
036	1981	Olds/Delta 88	Rental	Per terms of contract
041	1981	Buick/Skylark	Rental	Per terms of contract
045	1981	Buick/Century	Rental	Per terms of contract
056	1981	Pontiac/Grand Prix	Rental	Per terms of contract
057	1981	Pontiac/Grand Prix	Employee reference	Approved by Project Officer
078	1981	Ford/Thunderbird	Employee reference	Approved by Project Officer
081	1981	Merc/Lynx	Rental	Per terms of contract
083	1981	Merc/Zephyr	Rental	Per terms of contract
087	1981	Plymouth/Reliant	Rental	Per terms of contract
089	1981	Plymouth/Horizon	Rental	Per terms of contract
101	1981	AMC/Concord	Rental	Per terms of contract
111	1981	Datsun/210	Rental	Per terms of contract
132	1982	Merc/LN7	Rental	Per terms of contract
133	1982	Ford/EXP	Participant reference	Approved by Project Officer
145	1981	Ford/Pick Up	Employee	Approved by Project Officer
127	1980	Chev/Citation	Employee	Approved by Project Officer
240	1980	Mercedes/450 SL	Obtained thru Dealer	Approved by Project Officer
287	1978	Ford/Mustang	Employee	Approved by Project Officer
103	1981	Toyota/Tercell	Employee reference	Approved by Project Officer
105	1981	Toyota/Tercell	Rental	Per terms of contract
130	1982	Ford/EXP	Employee reference	Approved by Project Officer
131	1982	Merc/LN7	Rental	Per terms of contract
061	1982	Pontiac/J2000	Rental	Per terms of contract
075	1981	Ford/Mustang	Rental	Per terms of contract
016	1981	Chev/Malibu	Rental	Per terms of contract
097	1982	Merc/LN7	Rental	Per terms of contract
098	1982	Merc/LN7	Rental	Per terms of contract
099	1982	Merc/LN7	Rental	Per terms of contract

TABLE III-3

SECTION IV

VEHICLE, PREPARATION, INSPECTION AND MAINTENANCE

A. INITIAL MECHANICAL INSPECTION

After a vehicle was screened by telephone, the owner was asked to deliver it to the laboratory for testing. On arrival, the vehicle was checked for exhaust leaks and the Vehicle Information Data Sheet and the Engine Parameter Data Sheet (Appendix B) were completed. During this process, all emission control systems and sub systems were checked to verify that they matched those listed in the Gas Mileage Guide for that model year. Variances were noted when found.

A fuel sample was taken from the vehicle fuel tank for lead content analysis. The vehicle was then delivered to the Chassis Dynamometer Testing Laboratory for preconditioning and testing.

B. POST TEST INSPECTION

On completion of the "as received" emissions test, each vehicle received a thorough engine and emission control systems inspection. Appendix B of this report contains a copy of the data sheets that were used to record the inspection information. The methods for inspection and specifications for operating parameters on each system were obtained from Manufacturer's shop manuals or Chilton's Automotive Manuals for the appropriate model. Information from the emissions data sticker, which is found in the engine compartment, was used when available. Observed values, (i.e. basic timing, idle speeds, idle HC and CO levels, etc.) were recorded on the Inspection Data Sheets (Appendix B). The Comments Data Sheet (Appendix B) was used to note any maladjustments, disabled systems or abnormal operating conditions that were found during the inspection.

Representatives from General Motors and the Chrysler Corporation actively participated in the inspection and maintenance portions of this project. The EPA Project Officer allowed these representatives to receive copies of emissions test data and observe and/or assist in the inspection and maintenance procedures for their companies respective vehicles. On numerous occasions this participation was beneficial in locating parts, and supplying technical information for emission control systems.

C. RESTORATIVE MAINTENANCE

The first fifty vehicles which failed the "as received" tests were subjected to a restorative maintenance procedure and a retest.

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Pass/fail criteria for the various model years were established by the EPA as follows:

1. Emission results which were within two times the standard for that model year were considered a pass with the following exception. If, during the inspection procedure a problem was found that could account for excessive emissions, a maintenance procedure and retest was recommended. These maintenance procedures and retests were authorized by the EPA in some instances, although the results did not exceed the two times limit.

2. In order to simplify the complexity of 1981 standards (due to the various waivers that were granted), the following standards are used as a guideline for all 1981 vehicles:

HC gm/mi	CO gm/mi	*NOx gm/mi
.41	7.0	1.0

* A 2.0 NOx gm/mi standard applied to all 1981 American Motors Corporation vehicles.

3. Idle test results greater than 200 PPM Hexane or 1.2% CO were considered a failure. This was based on the sample taken at the second idle in neutral during the four mode test (immediately after 2,500 RPM in neutral mode).

Once a failure was identified, the inspection-maintenance procedure was initiated. The first step was to review the manufacturer's recommended maintenance intervals. Each item listed for the last interval was inspected and a determination was made as to whether or not the required maintenance had been performed. Any part replacements, adjustments or checks required at the last interval that had not been performed were accomplished during the restorative maintenances.

A complete diagnostic performance check was made on the emission control systems and sub systems in order to locate the problems. Adjustments and/or replacements were made as necessary to bring all systems back to manufacturer's specifications.

When the problem was diagnosed as a malfunction in a major component (any single item which would cost in excess of $100.00 to repair or replace) no restorative action was taken. The EPA was notified in these cases. Any further action on vehicles in this category was at the EPA's discretion. In all cases the restorative maintenance activities were documented in detail on the Comment Data Sheet (Appendix B) in the After Maintenance Data Packet (Appendix B).

Table IV-1 lists each of the restorative maintenances, what problems were found, and the corrective action taken.

RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results		Corrective Actions	After Maint. Test Results		% Δ
				Test Type	Emissions Results (Failed Standards)		Test Type	Emissions Results	
214	1980	11,183	AMC/Concord	CVS-CH	HC gm/mi 1.07 CO gm/mi 38.0	Found broken wire on the open loop close loop switch. Repaired wire. Changed EGR valve and spark plugs.	CVS-CH	HC gm/mi .409 CO gm/mi 6.29	- 62% - 83%
267	1978	36,261	Datsun/280Z	CVS-CH	HC gm/mi 7.58 CO gm/mi 172.	Major problem with the fuel injection system. Repair cost would have exceeded contractual limitations. (Not retested)	-	N/A N/A	-
196	1980	6,442	Ford/Futura	CVS-CH	HC gm/mi 2.03	Spark plugs appeared oil fouled. Conducted cylinder compression and leakdown test; results within manufacturer's specification. Problem was diagnosed as oil leak in valve guides and seals. Repair cost would have exceeded contractual limitations. (Not retested)	-	N/A	-
251	1979	27,956	Chev/Chevette	CVS-CH	HC gm/mi 1.46 CO gm/mi 22.3	Spark plugs fouled; no other problems found. (Not retested)	-	N/A N/A	-
289	1978	30,964	Ford/Granada	CVS-CH	HC gm/mi 1.64 CO gm/mi 34.0	Reset idle mixture to manufacturer's specs. Replaced spark plugs and air filter element.	CVS-CH	HC gm/mi .707 CO gm/mi 6.78	- 57% - 80%
255	1979	34,118	Olds/Cutlass	CVS-CH	HC gm/mi 1.64 CO gm/mi 24.5	Reset choke index to manufacturer's specs.	CVS-CH	HC gm/mi 1.51 CO gm/mi 20.1	- 8% - 18%
258	1979	17,845	Pontiac/Sunbird	CVS-CH	HC gm/mi 3.01 CO gm/mi 33.2	Reset idle mixture to manufacturer's specs and replaced spark plugs.	CVS-CH	HC gm/mi .090 CO gm/mi 7.75	- 97% - 77%
198	1980	19,531	Ford/Fairmont	CVS-CH	HC gm/mi 6.32 CO gm/mi 89.6	Reset idle mixture to manufacturer's specs (one mixture screw was damaged and had to be replaced). Reconnected vacuum supply line to air diverter valve.	CVS-CH	HC gm/mi .508 CO gm/mi 5.18	- 92% - 94%

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RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results		Corrective Actions	After Maint. Test Results		% Δ
				Test Type	Emissions Results (Failed Standards)		Test Type	Emissions Results	
197	1980	11,915	Ford/Fairmont	CVS-CH	HC gm/mi .809 CO gm/mi 34.7	Reset idle mixture to manufacturer's specs.	CVS-CH	HC gm/mi .282 CO gm/mi 12.0	- 65% - 66%
171	1980	17,812	Olds/Omega	CVS-CH	NO_x gm/mi 4.70	Removed vacuum delay valve from EGR vacuum supply line. The delay valve was not shown on the manufacturer's schematic.	CVS-CH	NO_x gm/mi 1.92	- 59%
221	1980	10,856	Datsun/210	Idle	CO % 378.	Reset idle mixture to manufacturer's specs.	Idle	CO % .013	- 99.9%
203	1980	11,128	Merc/Zephyr	CVS-CH	HC gm/mi 1.51 CO gm/mi 43.0	Reset idle mixture to manufacturer's specs and changed spark plugs	CVS-CH	HC gm/mi .484 CO gm/mi 17.4	- 68% - 60%
265	1979	23,413	Ply/Horizon	CVS-CH	HC gm/mi 2.59 CO gm/mi 28.0	Reset idle mixture to manufacturer's specs, changed spark plugs and PCV valve.	CVS-CH	HC gm/mi 1.74 CO gm/mi 6.36	- 33% - 77%
284	1979	39,308	Pontiac/Sunbird	CVS-CH	HC gm/mi 3.61 CO gm/mi 54.9	Reset idle mixture to manufacturer's specs and performed 24K maintenance interval (oil & filter change, spark plugs and PCV valve change).	CVS-CH	HC gm/mi 1.56 CO gm/mi 21.1	- 57% - 62%
285	1978	55,945	Pontiac/Lemans	CVS-CH	HC gm/mi 3.12 CO gm/mi 43.4	Reset idle mixture to manufacturer's specs. Changed air filter, PCV valve, PCV hose and PCV filter.	CVS-CH	HC gm/mi 1.48 CO gm/mi 12.0	- 53% - 72%
271	1979	49,753	Honda/Accord	CVS-CH	HC gm/mi 1.51 CO gm/mi 11.0	Reset idle mixture to manufacturer's specs.	CVS-CH	HC gm/mi 1.04 CO gm/mi 6.21	- 31% - 44%
292	1978	26,534	Ply/Horizon	CVS-CH	HC gm/mi 2.32 CO gm/mi 49.5	Reset idle mixture to manufacturer's specs. Changed spark plugs and PCV valve.	CVS-CH	HC gm/mi .359 CO gm/mi 6.48	- 85% - 87%
263	1979	23,743	Merc/Monarch	CVS-CH	HC gm/mi 1.14 CO gm/mi 17.0	Reset idle mixture to manufacturer's specs. Changed spark plugs, and EGR valve.	CVS-CH	HC gm/mi .557 CO gm/mi 5.28	- 51% - 69%

TABLE IV-1
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RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	% Δ
161	1980	23,297	Chev/Citation	CVS-CH	NO$_x$ gm/mi 4.42	Pulse air system was disabled. Reactivated pulse air system, changed spark plugs and EGR valve.	CVS-CH	NO$_x$ gm/mi 2.21	- 50%
253	1979	22,958	Chev/Malibu	CVS-CH	NO$_x$ gm/mi 5.30	Changed EGR valve and spark plugs.	CVS-CH	NO$_x$ gm/mi 1.21	- 77%
286	1978	26,865	Ford/Pinto	CVS-CH	HC gm/mi 9.46 CO gm/mi 90.0	Reset idle mixture to manufacturer's specs. Changed air filter element and spark plugs.	CVS-CH	HC gm/mi 4.74 CO gm/mi 36.4	- 50% - 60%
199	1980	18,862	Ford/Granada	CVS-CH Idle	CO gm/mi 12.0 HC ppm 239. CO % 4.98	Reset idle mixture to manufacturer's specs.	CVS-CH Idle	CO gm/mi 2.16 HC ppm 5.77 CO % .009	- 82% - 98% - 99.8%
030	1981	4,121	Olds/Cutlass	CVS-CH	HC gm/mi .723 CO gm/mi 10.8	Idle mixture control solenoid was defective. With approval of the EPA, GM supplied new carburetor assembly. Installed new carburetor.	CVS-CH	HC gm/mi .253 CO gm/mi 2.82	- 65% - 74%
036	1981	6,880	Olds/Delta 88	CVS-CH	CO gm/mi 8.14	Reset basic timing to manufacturer's specs. (10° advanced as received)	CVS-CH	CO gm/mi 4.22	- 48%
276	1978	56,615	Chev/Chevette	CVS-CH Idle	CO gm/mi 19.4 CO % 1.94	Reset idle mixture to manufacturer's specs. Changed spark plugs, PCV valve and fuel filter.	CVS-CH Idle	CO gm/mi 9.11 CO % .006	- 53% - 99.7%
190	1980	13,525	Pontiac/ Bonneville	CVS-CH	NO$_x$ gm/mi 4.28	Reconnected EGR vacuum supply line.	CVS-CH	NO$_x$ gm/mi 1.93	- 55%
300	1978	49,950	Ford/F150	CVS-CH Idle	HC gm/mi 7.29 HC ppm 1190.	Replaced vacuum operated choke pull off, repaired carb. leaks, changed spark plugs, PCV valve and reset idle RPM. Also diagnosed engine misfire due to burned exhaust valve. Repair of the problem would have exceeded contractual limitations.	CVS-CH Idle	HC gm/mi 6.45 Hc ppm 284.	- 12% - 76%

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RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results Test Type	As Rec'd Test Results Emissions Results (Failed Standards)		Corrective Actions	After Maint. Test Results Test Type	After Maint. Test Results Emissions Results		% Δ
186	1980	5,453	Pontiac/Sunbird	CVS-CH	NO_x gm/mi	5.83	Reset idle mixture to manufacturer's specs and unplugged EGR vacuum supply line.	CVS-CH	NO_x gm/mi	1.21	- 79%
007	1981	6,983	Chev/Chevette	CVS-CH	HC gm/mi	1.17	Signal from O2 sensor was within limits, but signal was erratic. The EPA approved O_2 sensor change (GM provided) and retest.	CVS-CH	HC gm/mi	1.05	- 10%
					CO gm/mi	12.8			CO gm/mi	9.26	- 28%
				Idle	CO %	2.53		Idle	CO %	1.04	- 59%
104	1981	3,747	Toyota/Corolla	CVS-CH	HC gm/mi	2.21	Owner admitted using leaded fuel. Reconnected air pump supply line to air cleaner and reconnected hot air tube to air cleaner.	CVS-CH	HC gm/mi	1.78	- 20%
					CO gm/mi	22.0			CO gm/mi	13.0	- 42%
				Idle	HC ppm	400.		Idle	HC ppm	355.	- 11%
260	1979	14,879	Ford/Mustang	CVS-CH	CO gm/mi	35.2	Reset idle mixture to manufacturer's specs and changed spark plugs.	CVS-CH	CO gm/mi	2.56	- 93%
211	1980	9,011	Dodge/Aspen	CVS-CH	HC gm/mi	.812	Reset idle mixture, idle RPM's and basic timing to manufacturer's specs.	CVS-CH	HC gm/mi	.704	- 13%
					CO gm/mi	12.7			CO gm/mi	9.61	- 24%
093	1981	3,160	Dodge/Omni	CVS-CH	HC gm/mi	.307	Vehicle passed standards as received but during the inspection it was discovered that the emission control module was improperly wired. The lead wire to the O2 sensor was also disconnected. This was apparently done when an after market A/C was installed. The EPA authorized repair and retest.	CVS-CH	HC gm/mi	.224	- 27%
					CO gm/mi	4.55			CO gm/mi	1.22	- 73%
264	1979	26,261	Dodge/Omni	CVS-CH	NO_x gm/mi	4.56	Reset idle mixture to manufacturer's specs. Repaired tampering change made to idle solenoid plunger assembly and removed plug from EGR vacuum supply line. Changed spark plugs and PCV filter.	CVS-CH	NO_x gm/mi	1.31	- 71%

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RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results: Test Type	As Rec'd Test Results: Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results: Test Type	After Maint. Test Results: Emissions Results	% Δ
237	1980	10,668	Dodge/Colt	CVS-CH	HC gm/mi .535 CO gm/mi 23.0	Reset idle mixture and idle RPM's to manufacturer's specs. Changed spark plugs. Restorative maintenance did not cause any substantial change in emissions results. Chrysler representative assisted in this maintenance procedure and could offer no further suggestions other than catalyst damage. Replacement of catalyst would exceed contractual limitations.	CVS-CH	HC gm/mi .654 CO gm/mi 25.0	+ 22% + 9
291	1978	46,376	Dodge/Aspen	CVS-CH Idle	HC gm/mi 2.18 CO gm/mi 21.0 NO_x gm/mi 4.06 HC ppm 309. CO % .161	Reset idle mixture, idle RPM's and basic timing. Changed spark plugs, PCV valve, evap. canister purge line, evap. canister vent line, EGR vacuum supply hose, vacuum amplifier, fuel filter and carburetor base gasket. Restorative maintenance resulted in increases on some emissions. A Chrysler representative assisted in this maintenance procedure and the increases were attributed to the overall poor condition of this vehicle.	CVS-CH Idle	HC gm/mi 2.38 CO gm/mi 12.8 NO_x gm/mi 2.64 HC ppm 612. CO % .026	+ 9% - 39 - 35% + 98% - 84%
209	1980	22,045	Chrylser/ Le Baron	CVS-CH	HC gm/mi .685 CO gm/mi 24.0	Reset idle mixture to manufacturer's specs.	CVS-CH	HC gm/mi .402 CO gm/mi 8.36	- 41% - 65%
229	1980	6,900	Honda/Accord	Idle	CO % 1.34	Reset idle mixture to manufacturer's specs.	Idle	CO % .232	- 83%
234	1980	11,200	Volks/Dasher	CVS-CH Idle	HC gm/mi 1.37 CO gm/mi 19.0 CO % 1.80	Reset fuel injector limiting device to manufacturer's specs.	CVS-CH Idle	HC gm/mi .436 CO gm/mi 3.90 CO % .006	- 68% - 80% - 99.6%

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RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results		Corrective Actions	After Maint. Test Results		% Δ
				Test Type	Emissions Results (Failed Standards)		Test Type	Emissions Results	
152	1980	33,020	Chev/Chevette	CVS-CH	CO gm/mi 31.6	Replaced pulse air distribution element and purge valve for pulse air system. Changed spark plugs, PCV valve in accordance with manufacturer's recommendations for last regular schedule maintenance interval.	CVS-CH	CO gm/mi 18.5	- 41%
[illegible]05	1981	6,282	Chev/Chevette	CVS-CH	HC gm/mi .834 CO gm/mi 9.91	Engine would not respond to propane enrichment. GM representative diagnosed the problem an improperly set idle mixture (sealed carb.) The EPA authorized a carburetor assembly change (GM supplied) and retest.	CVS-CH	HC gm/mi .336 CO gm/mi 4.12	- 60% - 58%
048	1981	10,529	Buick/Regal	CVS-CH	CO gm/mi 6.52	Reset choke plate opening angle to manufacturer's specs.	CVS-CH	CO gm/mi 2.36	- 64%
019	1982	6,727	Chev/Malibu	CVS-CH	NO_x gm/mi 1.20	Reconnected vacuum supply line to EGR valve.	CVS-CH	NO_x gm/mi .631	- 47%
149	1981	7,373	Datsun/Pickup	Idle	HC ppm 275. CO % 1.77	Reset idle mixture to manufacturer's specs and changed spark plugs.	Idle	HC ppm 64.8 CO % .009	- 76% - 99.5%
254	1979	33,708	Chev/Camaro	CVS-CH	HC gm/mi 3.99 CO gm/mi 108.	Reset idle mixture and idle RPM's to manufacturer's specs. Changed fuel filter, air filter, PCV filter, PCV valve, PCV supply line.	CVS-CH	HC gm/mi .881 CO gm/mi 6.31	- 78% - 94%
				Idle	HC ppm 211. CO % 2.89		Idle	HC ppm 78.7 CO % .007	- 63% - 99.8%
156	1980	18,250	Chev/Monza	CVS-CH	NO_x gm/mi 3.07	Rerouted vacuum lines in accordance with manufacturer's specs. Reset idle RPM's and basic timing to manufacturer's specs.	CVS-CH	NO_x gm/mi 1.85	- 40%

RESTORATIVE MAINTENANCES

				As Rec'd Test Results			After Maint. Test Results		
Vehicle Number	Year	Odometer	Make/Model	Test Type	Emissions Results (Failed Standards)	Corrective Actions	Test Type	Emissions Results	% Δ
299	1978	33,763	Chev/C-10 Pickup	CVS-CH	HC gm/mi 4.96 CO gm/mi 68.2	Diagnosis indicated a defective power valve in the carburetor, installed carburetor kit. Reset basic timing and set carburetor to specs.	CVS-CH	HC gm/mi 3.42 CO gm/mi 52.6	- 31% - 23%
279	1979	68,593	Chev/Malibu	CVS-CH Idle	HC gm/mi 6.10 CO gm/mi 84.53 HC ppm 641. CO % 5.15	Reset idle mixture, curb idle, fast idle and basic timing to specs.	CVS-CH Idle	HC gm/mi 2.32 CO gm/mi 32.0 HC ppm 25.6 CO % .009	- 62% - 62% - 96% - 99.8%
280	1978	40,951	Chev/Monte Carlo	CVS-CH Idle	HC gm/mi 2.11 CO gm/mi 36.1 HC ppm 261. CO % 3.07	Reset idle mixture to manufacturer's specs. Changed spark plugs, air filter, PCV valve, PVC filter, EGR valve and fuel filter.	CVS-CH Idle	HC gm/mi .887 CO gm/mi 14.3 HC ppm 28.7 CO % .009	- 58% - 60% - 89% - 99.7%
178	1980	26,384	Olds/Delta 88	CVS-CH	CO gm/mi 11.3	Reset primary choke vacuum break and curb idle speed to manufacturer's specs.	CVS-CH	CO gm/mi 9.60	- 15%
168	1980	31,670	Chev/Impala	CVS-CH	HC gm/mi 2.91 CO gm/mi 56.8	Reset idle mixture and basic timing to manufacturer's specs. Changed spark plugs, air filter and PCV filter.	CVS-CH	HC gm/mi 2.73 CO gm/mi 45.6	- 6% - 20%
236	1980	19,652	Dodge/Colt	CVS-CH	CO gm/mi 53.6	Reset idle mixture to manufacturer's specs. Changed spark plugs.	CVS-CH	CO gm/mi 19.7	- 63%
069	1981	3,652	Ford/Escort	CVS-CH	HC gm/mi 1.04 CO gm/mi 15.0	Reconnected hot air stove pipe from the exhaust manifold to the air intake.	CVS-CH	HC gm/mi .918 CO gm/mi 12.2	- 12% - 19%

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RESTORATIVE MAINTENANCES

Vehicle Number	Year	Odometer	Make/Model	As Rec'd Test Results Test Type	As Rec'd Test Results Emissions Results (Failed Standards)	Corrective Actions	After Maint. Test Results Test Type	After Maint. Test Results Emissions Results	% Δ
*063	1981	9,645	Cadillac/ Barritz	CVS-CH	CO gm/mi 8.15 NO_x gm/mi 4.00	During bags one and two of the "as received" FTP CVS-CH test the engine would not come off of fast idle. The G.M. representative diagnosed the problem as a faulty ECM and malfunctioning fuel injectors. These components were replaced. While attempting to retest, the check engine light came on and problem codes were found. With the approval of the Project Officer the vehicle was then taken to a local Cadillac dealer for repairs. The throttle position sensor was replaced by the dealer.	CVS-CH	CO gm/mi 2.96 NO_x gm/mi .751	- 64% - 81%
*058	1981	5,669	Pontiac/ Bonneville	CVS-CH	HC gm/mi 8.88 CO gm/mi 205. NO_x gm/mi .325	Replaced O_2 sensor. A G.M. representative assisted in this diagnosis and repair.	CVS-CH	HC gm/mi 4.53 CO gm/mi 27.4 NO_x gm/mi 3.94	- 49% - 87% +1112%
				Idle	HC ppm 354. CO % 4.03		Idle	HC ppm 152. CO % .526	- 57% - 87%

* Vehicles 063 and 058 were tested after the required 50 I/M procedures had been completed. At the manufacturer's request, the Project Officer agreed to allow retest on the vehicles. These retests will be applied to the contractual requirements for the FY81 project.

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SECTION V

VEHICLE EMISSION TESTING

A. TEST LABORATORY

EG&G-AR Chassis Dynamometer Testing Laboratory is located at 5404 Bandera Road, San Antonio, Texas. A floor plan of this lab is included as Figure V-1. This lab presently consists of two automotive test cells with chassis dynamometers, one motorcycle chassis dynamometer test cell, emissions analytical equipment, soak area and support equipment. Details on most equipment are available in Appendix C, EPA Laboratory Qualification Worksheets.

Test Cell Number One was exclusively used for the data generated in the Emission Factor Program. This cell contains a Clayton ECE-50 chassis dynamometer with an inertia range from 1000 lbs. to 8875 lbs. in 125 lb. increments. The drivers aid is a Hewlett Packard 7133A recorder. A Hartzell N24D WW fan was used in this cell.

A CFV-CVS System was utilized for testing under this contract. The system is a Horiba Model 20-B-CFV-CVS with a flow capacity of 325 CFM. Details may be found in Appendix D.

The Emission Analytical Console used was constructed by Horiba Instruments according to EG&G-AR specifications. The console contains a total of seven analyzers on two sample trains for both dilute and raw exhaust gas analysis. Details on this console may be found in Appendix D. Additionally, a Horiba Mexa 321 E was used for undiluted HC (Hexane) measurements.

EG&G-AR's Chassis Dynamometer Testing Laboratory has a soak area capacity of approximately 14 vehicles, dependent upon vehicle size. Soak area temperature is controlled year-round to a target 74 ± 3 F.

A full complement of support equipment is located in the Chassis Dynamometer Testing Laboratory. This equipment is detailed in Appendix D but essentially consists of temperature and humidity recorders, a barometer, clocks, timers, calibration equipment, lead (Pb) test kit and a zero gas generator.

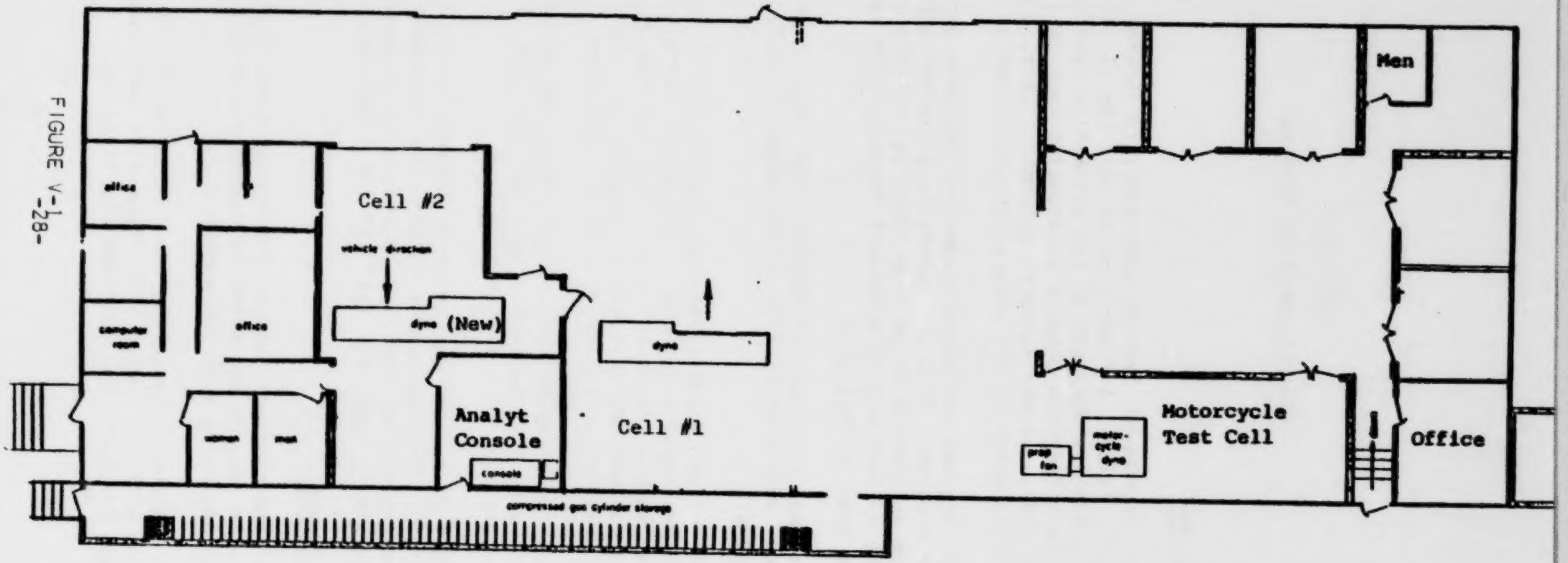
B. EQUIPMENT CHANGES

At the start of the contract period, the Horiba Console was used to measure undiluted HC, with results converted to Hexane equivalent. Later the Mexa 321 E was used, beginning with run number 61.

The only other equipment change was the initiation of the use of Plumbtesmo kits. Beginning with run number 134, these kits were used to detect the presence of lead traces in the test vehicle tailpipes.

EG&G AUTOMOTIVE RESEARCH, INC.

CHASSIS DYNAMOMETER TESTING LABORATORY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Cell #2
vehicle direction
dyno (New)
computer room
office
woman
man
Analyt Console
console
dyno
Cell #1
compressed gas cylinder storage
Men
prop fan
motor-cycle dyno
Motorcycle Test Cell
Office

FIGURE V-1

C. TEST PROCEDURES

1. Preconditioning Procedures

On all vehicles the "as received" fuel was drained and the tank refilled to tank-fuel volumes (40% of tank capacity) with the appropriate test fuel. The vehicles were run on the dynamometer for the first 505 seconds of the Federal Cycle. During preconditioning and the cold transient phase of the FTP, a vehicle driveability evaluation form was completed. The preconditioning ensured that the test fuel had purged the vehicle's fuel system and the engine had achieved a normal operating temperature. Test vehicles were then placed in the soak area. The required ambient temperature in the soak area was maintained and the prescribed 12 to 36 hour soak began. The ignition was not turned on again until the beginning of the emissions test.

2. FTP Procedure

The basic test performed on each vehicle was the Federal Test Procedure for exhaust emissions as described in Federal Register Vol. 42, No. 125 - Tuesday, June 28, 1977 and as amended in Vol. 43, No. 220 - Tuesday, November 14, 1978. This procedure was modified and expanded by EPA guidelines contained in the subject contract.

3. Highway Fuel Economy Test Procedures and Requirements

After the FTP the vehicle was operated on the chassis dynamometer at 50 miles per hour for a period of three minutes. The "50 cruise" short cycle test was performed at this time. Within one minute of this cruise period, the vehicle commenced operation over the 10.242 mile, 765 second driving schedule. The CVS system was used to gather the dilute exhaust for the purpose of emission and fuel economy calculations. The engine was at an idle condition at the beginning of the sampling period.

The tolerance of this driving schedule was identical to those defined in the basic FTP driving schedule.

Dynamometer loading and transmission shift points follow the procedures required for FTP tests.

4. Additional Test Cycles

This set of four short cycle tests included; 50 cruise, four-speed idle test, two-mode loaded test and bagged idle test. Measurements of diluted and undiluted HC, CO, CO_2 and NOx emissions were accomplished with instruments described in Section V-A. Test Laboratory. The entire sequence was conducted with the hood open and the auxiliary cooling fan on. For the final test, the inertia was reduced to the lowest available setting (1,000 lbs.). Each of the short cycle tests began after a six (± one) minute idle period with the transmission in neutral. The idle period began immediately after the end of the preceding test. If the time between tests was exceeded by less than two hours, the vehicle was preconditioned by driving the first 505 seconds of the FTP Driving Schedule. The test sequence then resumed, beginning with a six minute idle. If the idle time was exceeded by more than two hours, the vehicle was placed in soak from 12-36 hours and retested from the beginning of the cold start FTP. In each case, equilibrium of engine (or vehicle) speed and analyzer outputs were achieved before the readings are taken. Only in the case of the 50 Cruise Test, did the mode exceed 30 seconds after the proper engine (or vehicle) speed and dynamometer load had been reached. Emission values were monitored continuously on strip chart recorders. Sample data sheets are located in Appendix C. Details of the procedures for each of the short cycles are listed below.

a. The 50 Cruise Test was a high speed loaded test that takes advantage of the three minute preconditioning run before the HFET. Tailpipe emissions were measured and recorded continuously throughout the period although the official sampling period ended 30 seconds after speed and load had stabilized at 50 mph.

b. The Four-Speed Idle Test involved four steady state idle conditions with the transmission in neutral. Emissions were measured and recorded at basic idle, idle at 2500 rpm and after returning to basic idle. The transmission was then placed in drive (with brakes applied) for sampling in the fourth mode.

c. The Two-Mode Loaded Test consisted of two operating conditions. At the end of the six minute idle period, the vehicle was operated at 30 mph while setting 9.0 actual horsepower. Immediately following sampling in this mode, the vehicle was returned to the idle mode, the transmission placed in neutral and the emissions sampled again.

d. The Bagged Idle Test followed the FTP and preceded the HFET. The Bagged Idle Test required the use of the same instrumentation as the FTP to measure dilute exhaust emissions during one steady state of operation.

   The test was preceded by an "engine-off" soak period of six (± one) minutes. At the end of this soak period, the vehicle was restarted and operated for three minutes at idle with the transmission in drive (manual transmission vehicles were operated in neutral with the clutch engaged). The three minute sampling period began at the time the starter was engaged so that the engine cranking was included as part of the sample. During the three minute period, the exhaust sample was gathered through the CVS.

D. CALIBRATIONS

The following calibrations were performed routinely during the contract period. No changes in usual lab operations were required to meet the requirements of the subject contract.

1. Chassis Dynamometer

The chassis dynamometer received the following calibrations: A complete calibration was performed prior to initiation of testing. The calibration included speed, load cell deadweight, deadband adjustment and dynamometer coastdowns. This calibration was repeated after maintenance was performed that could affect the calibration or whenever a weekly verification exceeded the ± 0.5 road load horsepower tolerance.

On a weekly basis coastdown times were verified on half of the inertia weight and road load combinations used. The following week the remainder of the inertia weight and road load combinations used were verified. A speed check at 74.54 km/hr (46.3 mph), 1800 rpm was performed on a weekly basis.

During the dynamometer warm-up and prior to the start of each test, the indicated horsepower for the selected inertia weight was verified at 50 mph.

The dynamometers were lubricated and maintained in accordance with Clayton's recommended maintenance schedule.

2. CVS System

The CFV-CVS System received a complete calibration, according to the guidelines set forth in Title 40, Code of Federal Regulations, Part 86, Section 86.199-78 (b) CFV calibration, prior to the start of the program, when maintenance was performed that could have an effect on the calibration or when deemed necessary by Quality Control personnel.

The flow computation board calibration was verified on a weekly basis. If the variance of one counter exceeded ten counts from the average count or the calculated SCFM and the indicated SCFM exceed five counts, the flow computation board was adjusted.

On a daily basis a CVS System verification was performed using the propane recovery method as outlined in Title 40, Code of Federal Regulations, Part 86, Section 86.199-78 (c). If the recovery was outside of the ± 2%

tolerance, the problem was identified and repaired. Two successive recoveries within ± 2% were obtained before testing began.

3. Analytical Bench

Monthly calibrations on all used analyzer ranges were conducted using seven gases spaced evenly over each range (e.g., zero, 15, 30, 45, 60, 75 and 90 percent of full scale). The gases used to calibrate the CO, CO_2, and NOx analyzers are all single blend gases with nitrogen as the diluent. The gases used for the FID were single blend gases using propane with air as the diluent. All of the above gases were purchased from Scott Specialty Gases and were gravimetric blends with certified analysis (± 1%) and are traceable to NBS standards. An Aadco Model 737-13 pure air generator was used for all zero air requirements. The operation of this generator was verified weekly by cross-checks with compressed zero air with certified levels of impurities. A complete calibration was performed following maintenance or when curve checks were out of limits.

On a weekly basis all analyzer curves were checked using the span gas and three of the gravimetrics (e.g. 90, 60, and 30% of full scale). If any of the readings exceeded ± 1% of the concentration for gases, above 50% of meter, the instrument received a complete calibration. On alternating weeks, 75, 45, and 15% gravimetrics were substituted in the procedure.

The entire analytical system was leak checked daily. Zero and span drift on all analyzer ranges measured and recorded, zero and span pot settings were recorded, NOx converter efficiency was checked and CO analyzer vapor interference was checked using CO2 bubbled through water. Propane recoveries were performed, span gas cylinder pressures recorded, HC hangup was checked and ambient HC and CO analysis was performed.

4. Soak Area Temperature Recorder and Wet Bulb/Dry Bulb Recorder

The temperature recorders were calibrated monthly by referencing the temperature sensors to a certified thermometer. They were checked at ambient, cool (approx. 60° F) and warm (approx. 90° F) temperatures. Response time was recorded.

The recorder was checked daily at ambient temperatures.

5. Strip Chart Recorders

The chart speed and linearity of all emissions recorders and the driver's aid were checked weekly. Response time and deadband adjustments were also checked during this calibration. The data forms used for all calibrations and functional checks are included in Appendix D.

6. Quality Audit

In order to ensure that all calibrations were completed in a consistent manner and that no procedural or operational errors had occured during the calibrations, each completed data sheet was audited by the EG&G-AR Quality Control Group.

SECTION VI

TEST RESULTS

All test results were transferred to special data sheets (included in Appendix B) provided by the EPA. After review by the EPA, these packets were forwarded to Systex Inc. which was contracted by the EPA to process all data supplied by the Emission Factor testing contractors.

Because of this arrangement, EG&G-AR's contract required that test data not be included as part of the final report.

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SECTION VII

DATA HANDLING

A. EMISSIONS TEST AUDITING AND VALIDATION

Upon completion of each vehicle test sequence, test data packets were reviewed by the Quality Control Department, independent from testing operations. This review consisted of:

1. Checks for errors, omissions and legibility.

2. Verification of time specifications.

3. Application of current calibration data and use of properly calibrated equipment.

4. Compliance with FTP specifications.

To ensure consistency and completeness of audits, a group of checklists was utilized. These checklists are located in Appendix E. When problems were discovered in the data packets, the packet was returned to the appropriate technician for corrections. If any inconsistencies could not be resolved, the test was invalidated.

B. TEST DATA TRANSMITTAL

After completion and review of each data packet, the packet was forwarded to the EPA via United Parcel Services. As directed by the EPA, on July 15, 1981, all data packets were sent to Systex, Inc., via United Parcel Services.

C. CALIBRATION DATA TRANSMITTAL

On a weekly basis a copy of all calibrations was sent to the EPA. This packet also included daily work summary logs, daily instrument checks and the barometric recording for the week. The packet included information generated from Monday to Sunday of each week.

Beginning in mid July, the monthly analytical instrument calibration curves were sent to Systex, Inc. as directed by the EPA. The remainder of the packet continued to be sent directly to the EPA.

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APPENDIX A

Sample Procurement Packet

1) Letter of Introduction
2) Emission Factor Testing Program - Question and Answers
3) Telephone Questionnaire
4) Incoming Vehicles Inspection Sheet
5) Test Agreement
6) Standard Vehicle Loan Agreement
7) Savings Bond Information Sheet
8) Test Agreement Addendum
9) University of Michigan Questionnaire
10) EG&G-AR Letter of Appreciation
11) EG&G-AR Letter of Acknowlegement for Response
12) Vehicle Owner Questionnaire Data Sheet

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR ,MICHIGAN 48105

OFFICE OF
AIR. NOISE AND RADIATION

Dear Vehicle Owner:

As you may know, the Environmental Protection Agency and EG & G Automotive Research are conducting an important research program on air pollution from motor vehicles in San Antonio. You have been selected by a random, scientific sampling procedure as a possible participant in this program, which involves analyzing exhaust emissions from certain vehicles. We hope you will agree to take part in this important effort.

If your vehicle matches our research specifications, we will provide you with a late-model loaner car for the several days that your car is being examined by EG & G. Both your vehicle and the one being loaned to you will be insured. Your car will be returned to you with a full tank of gasoline and you will also receive a $100 United States Savings Bond as our way of thanking you for your help. Your participation in this research will be an important contribution toward solving this country's air pollution problems.

Please fill out and mail the enclosed postage-paid card as soon as you can. If you are willing to participate, a representative of EG & G will be in touch with you to ask a few questions about your vehicle. The enclosed information sheet answers some questions people often ask about this research program. If you have any additional questions about your participation, please feel free to call Mr. Kevin Kott of EG & G at 684-2310. He will be happy to answer any questions you may have.

We look forward to receiving your reply card very soon.

Sincerely,

Thomas C. Bejma, Project Officer
Emission Control Technology Division

Enclosures

EMISSION FACTOR TESTING PROGRAMS

Questions and Answers

1. Must I participate in this program?

   No, your cooperation in this research program is completely voluntary. If, for any reason, you decide not to participate, please let us know on the enclosed postpaid reply card.

2. Why should I participate?

   In addition to the free gasoline and a $100.00 U.S. Savings Bond, your participation will benefit you indirectly by helping EPA understand and improve the quality of the air in and around your city.

3. How long will the examination take?

   While the examination itself takes only about an hour, the vehicle must be completely cooled off before the examination can begin. This requires that the vehicle not be started for 12 to 36 hours to simulate overnight parking. Therefore, we will need to have your vehicle at the laboratory for two or three days. You will be contacted once the evaluation is complete so that arrangements can be made to pick up your vehicle. In general, we suggest that you plan to use the loaner car for three to four days.

4. Will my vehicle be mistreated in any way?

   No, every aspect of the evaluation has been designed to duplicate everyday operation.

5. Exactly what will be done to my vehicle?

   Once the vehicle is sufficiently cooled off, it will be pushed onto a dynamometer. Although the vehicle does not actually move during the examination, the dynamometer is a type of treadmill which simulates conditions which would normally be encountered on the road. A hose is connected to the exhaust pipe to collect the exhaust. A specially trained driver then starts the vehicle and "drives" it through a "driving cycle" which represents typical operation in urban, suburban, and rural areas. Throughout this time, a portion of the exhaust gases are collected for subsequent analysis. This analysis allows us to calculate the quantity of exhaust emissions emitted by your vehicle. Values for the city and highway fuel economy are also calculated. A complete inspection of the emission control components is conducted after the examination.

6. How many miles will my vehicle be driven during the program?

   Your vehicle will be driven approximately 50 odometer miles during the examination. The majority of these miles will be accumulated indoors on the dynamometer. A 10 minute drive will precede the examination.

7. How will my vehicle be protected while in the contractor's possession?

   In addition to the insurance provided by the contractor, your vehicle will be stored indoors while the examination is being conducted. If required to be parked outside, your vehicle will be located in a secure area.

8. What determines whether or not my vehicle will be ultimately selected?

   Your vehicle has been initially identified by a statistically random sampling procedure. In order to obtain a cross section of the population of vehicles on the road, certain other criteria such as make, model and model year must be met. We are examining a limited number of vehicles that meet these particular specifications. If your vehicle meets these criteria, the final decision on whether your vehicle is selected will be based on a random process.

9. What happens to the information obtained from my vehicle?

   The information collected as a result of this program is used to determine how the entire population of in-use vehicles is affecting air quality. The data from your vehicle are combined with data from several hundred other vehicles in this area in order to obtain a statistically valid sample.

10. How can I obtain the results from your examination of my vehicle?

    After the completion of the examination you will be provided with a form to complete and return to us. This form has a space in which you may indicate your desire to obtain the results on your vehicle. We will forward them to you as soon as all the data have been processed.

Control No. ________
DATA FORM NO. 3024.2
Page 1 of 3

TELEPHONE QUESTIONNAIRE

Date ______________ and time __________ of contact:

If owner was not contacted, list the number of attempts that have been made ____________ (eliminate after three attempts).

Individual Contacted: ______________________________

If you were instructed to call back later, obtain convenient date ____________ and time __________.

VEHICLE CONTROL NO. ______________ TELEPHONE NO. ______________

* Mr./Mrs. ____________________, you have been randomly selected from a list of 19____ vehicle owners living in the San Antonio Metropolitan area. As the letter you recently received explains, a study of vehicle exhaust emissions is currently being conducted in this area by the United States Environmental Protection Agency and EG&G Automotive Research.

Your participation in this program is strictly voluntary. EPA is authorized by law to conduct this study and to offer incentives to you for your cooperation should you decide to participate.

Your cooperations will aid EPA's efforts to control air pollution due to vehicle exhaust.

The conditions for participation in this program are:

1) We ask you to bring your vehicle into our testing facility, which is located at 5404 Bandera Road. You will receive a late model loaner vehicle which will have a full tank of gas. This vehicle is yours to use for the duration of the testing program which will take approximately 3 to 4 working days. During this time we will be conducting a series of exhaust emissions test on your vehicle.

2) At the completion of our testing, if a full program has been performed, your vehicle will be returned to you with a tune-up and oil change (if required) and a full tank of gas. You will also receive a $100.00 U.S. Savings Bond for your cooperation in this study.

---

* If individual listed on the reply card was not contacted, enter name of person you talked with and indicate relationship i.e. husband, wife, son, daughter, friend, etc.

Telephone Questionnaire

Prior to releasing your vehicle into our possession you will be given some documents to sign. These documents, which will also be signed by an authorized EG&G Automotive Research representative, will define in detail these areas:

1) Initial Inspection form which will document the overall interior and exterior condition of your vehicle when received.

2) Test Agreement form which explains what sequence of tests your vehicle will be given and assign full liability responsibilities to EG&G Automotive Research for your vehicle while in our possession.

3) Loaner Car Agreement explains the terms and liability responsibilities for both parties in relation to the loaner vehicle.

4) Savings Bond information sheets. This form when completed will contain all the information necessary for a Savings Bond to be issued in your name.

Do you think you would be willing to participate in this program? ______ Yes ______ No

IF RESPONSE IS POSITIVE

For the purpose of identifying your vehicle as a possible candidate for this study, I am going to ask you a few question. None of this information can be used against you in any way and you should answer these questions to the best of your knowledge. Please indicate when you are not sure of something.

1) What is the made, model, year, transmission type, vehicle identification number and engine size?

MAKE__________________ MODEL______________ YEAR______________

TRANS: AUTO__________ MANUAL_____________ V.I.N.____________

ENGINE________________

2) What is the approximate odometer reading:________________________

3) Has your vehicle ever been involved in an accident? _______ Yes ______ No
If the answer is yes, indicate the type and extent of damage, i.e. frame, engine, drive train, cooling system, exhaust system, etc.

____

____

____

Telephone Questionnaire

4) Because this is an exhaust emissions test, it is critical that the exhaust systems on the vehicle tested be in good condition. To your knowledge, are the exhaust pipes, muffler and catalyst on your vehicle in good condition with no leaks or holes. ______ Yes ______ No

IF NO

Would you consider making the necessary repairs or replacements to your exhaust system at your own expense in order to participate in this program? ______ Yes _____No

IF NO ELIMINATE

If Yes try to obtain an estimate of when these repairs will be completed ____________________.

This should supply all of the information needed to determine if your vehicle is acceptable.

This information will have to be reviewed by the Project Manager and a decision should be made within the next few days. We will notify you as soon as possible.

Is it convenient for you if we contact you at this same number and time when the decision is made. ______ Yes ______ No

IF NO, obtain number and time __________________________.

Thank you very much for your cooperation.

INCOMING VEHICLE INSPECTION
SHEET PART II

TIRES: ________ RADIAL OR ________ BIAS

ENGINE SIZE: ____________________

BODY STYLE: ____________________

YEAR: ____________

MAKE/MODEL: ____________________

A/C ________ OR NONE A/C ____________

CAR NO.: ____________________________

☆ PLEASE GIVE JOHN R. INFORMATION

Control No. ________
Form No. 3024.1

EG&G AUTOMOTIVE RESEARCH, INC
5404 BANDERA ROAD, SAN ANTONIO, TEXAS 78238 • TEL(512)684-2310 TWX 910-871-1075

TEST AGREEMENT

Your vehicle is being loaned to EG&G AUTOMOTIVE RESEARCH, INC., for use in a government-sponsored program for cleaner air. This executed Agreement is your assurance of full protection against any loss sustained by accident or damage to the vehicle while in the possession of EG&G AUTOMOTIVE RESEARCH, INC., or its designed representatives.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to be fully responsible for any and all damage to the vehicle occurring while the vehicle is in its possession. Possession is hereby defined as care, control, custody, operation, inspection, or storage between the time the vehicle is received from the owner by EG&G AUTOMOTIVE RESEARCH, INC., and the time the vehicle is returned to the owner.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to indemnify and hold harmless the vehicle owner of any repairs, damage, loss, or liability sustained by the vehicle owner by reason of accident or damage to the vehicle while in its possession.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to provide primary automobile insurance on the vehicle while in its possession.

EG&G AUTOMOTIVE RESEARCH, INC., agrees to exercise extreme care in the use of the vehicle and agrees to return the vehicle to the owner in as good exterior, interior, and operating condition, except for normal wear and tear, as when the vehicle was received by EG&G AUTOMOTIVE RESEARCH, INC.

EG&G AUTOMOTIVE RESEARCH, INC., reserves the right to perform any repairs and maintenance upon the vehicle, at its sole discretion, provided all such repairs and maintenance are performed according to the manufactureres specifications.

I, ______________________________, agree to loan my vehicle, described as a ________(Year) ________________(Make and Model), registered in the State of ___________ under License Plate No. _________________ to EG&G AUTOMOTIVE RESEARCH, INC., for a period of approximately ________ days for a series of tests. I further agree that, should testing not be completed within the time period specified above, I will execute the Agreement Renewal which is an addendum to this Agreement, for the additional time required to complete testing. I understand that I may refuse to loan the vehicle to EG&G AUTOMOTIVE RESEARCH, INC., at any time and that I am under no obligation whatsoever.

AGREED TO this ________ day of ________________, 198__.

VEHICLE OWNER:

By: ________________________

EG&G AUTOMOTIVE RESEARCH

By: ________________________

Control No.______
Data Form No. 3024.4

STANDARD VEHICLE LOAN AGREEMENT

THIS STANDARD VEHICLE LOAN AGREEMENT (the "Agreement") is made and entered into by and between Mr./Mrs./Miss/Ms. ____________________________ of ____________________, ____________________ County, State of Texas (referred to in this Agreement as the "Participant"), and EG&G Automotive Research, Inc., a Texas corporation having a usual place of business at 5404 Bandera Road, City of San Antonio, Bexar County, State of Texas (referred to in this Agreement as "Automotive Research").

WITNESSETH THAT

WHEREAS: Automotive Research has entered into a contract with the United States Environmental Protection Agency under which Automotive Research will borrow cars from the public and test those cars to determine the effectiveness of their emissions control systems; and

WHEREAS: The Participant has agreed to let Automotive Research test the Participant's car on the condition that Automotive Research lend the Participant a car to use during the period of such tests; and

WHEREAS: Automotive Research is willing to lend a car to the Participant and the Participant is willing to accept the loan of such car (such car being referred to in this Agreement as the "Car") all on the terms and conditions hereinafter set forth,

NOW, THEREFORE: In consideration of the mutual covenants and agreements set forth in this Agreement, Participant and Automotive Research do hereby contract, covenant and agree as follows:

1. Automotive Research lends to and the Participant hereby accepts the loan of the Car whose license number and condition are set forth in the box at the bottom of the last page of this Agreement.

2. Participant agrees to exercise care in the use of the Car and agrees to return the Car to Automotive Research within forty-eight (48) hours, or two (2) working days, after notification of the completion of the tests on the Participant's own car, but in no event later than ten (10) days from the date of execution of this Agreement. Upon its return, the Car will have with it all tires, tools, and other accessories now contained in or installed on the Car. The Car and all such tires, tools, and accessories will, upon return, be in as good exterior and interior repair and operating condition as they now are and as is indicated in the box at the bottom of the following page, except for wear and tear caused by normal use and except for damage caused by casualty.

3. Participant agrees that the Car will not be operated to carry passengers or property for any money or other consideration, expressed or implied, or to push or tow any other vehicle or trailer. The Car will be operated only by Participant and permitted members of his immediate family, and provided that all such operators shall be duly qualified and licensed.

4. Participant agrees to be liable for: (a) all charges, fines, and costs for parking, traffic, or other legal violations assessed against the Car, Participant, or Automotive Research, except where caused through fault of Automotive Research; (b) Automotive Research's costs including reasonable attorney's fees, where permitted by law, incurred collecting payments due from Participant hereunder; (c) Automotive Research's costs to repair collision damages to the Car caused by the negligence or willful misconduct of the operator; provided, however, that Participant's liability for such damage will not exceed $100.00.

5. Participant and any authorized operator agree to participate as an insured in benefits of an automobile liability insurance policy, a copy of which is available from Automotive Research. Said policy comes before any other insurance carried by Participant or authorized operator and contains bodily injury or death liability limits of $250,000 for each person in each accident and is subject to the following limitations: A $500,000 limit for all persons in each accident and a property damage liability limit of $50,000 for each accident. Participant is bound by and agrees to the terms, conditions, limitations, and restrictions of said policy; it being understood that the policy is a standard Texas motor vehicle policy.

6. Participant releases Automotive Research from any liability for loss of or damage to any property left, stored, or transported by Participant or any other person in or upon the Car, during the term of this loan, or after return of the Car to Automotive Research.

TO WITNESS this Agreement, the Participant has signed below and Automotive Research has caused the Agreement to be executed by its authorized representative, all under seal, as of the _____ day of _____________, 198__, in the city of San Antonio, Texas.

PARTICIPANT:	EG&G AUTOMOTIVE RESEARCH, INC.:
By:______________________	
Driver's License #____________	
Expiration Date______________	By:______________________

CAR AND CONDITION

DATE:______________

Loan Car License No: __________________

Loan Car Condition: OUT________________OK/Initial

DATE_____________ IN ________________OK/Initial

Defects noted when Car was received by Participant:__________________

____

Control No.______
DATA FORM NO. 3024.6

EG&G AUTOMOTIVE RESEARCH, INC.
5404 Bandera Road
San Antonio, Texas 78238

SAVINGS BOND INFORMATION

NAME		SOCIAL SEC. NO.
STREET ADDRESS		
CITY	STATE	ZIP
HOME TELEPHONE NO.	BUSINESS TELEPHONE NO.	
THE FOLLOWING PERSON, IF ANY, IS TO	☐ OWNER ☐ CO-OWNER ☐ BENEFICIARY	
NAME	SOCIAL SEC. NO.	
MAILING ADDRESS (IF DIFFERENT THAN ABOVE)		
CITY	STATE	ZIP

CLASS/SERIAL NO.	
CODE NO.	
YEAR/MAKE OF VEHICLE	
MODEL OF VEHICLE	
ACCEPTED	REJECTED
BOND NO.	ISSUE DATE
REMARKS	

DATA FORM NO. [illegible]

TEST AGREEMENT ADDENDUM

I, __________________________ owner( ) and/or joint-owner( ) and/or principal driver( ) of the vehicle described as a (Year)_____________ (Make and Model)__________________________, registered in the State of _________________, agree to extend original testing agreement dated_______________, 19______ for a period of ____________ days.

VEHICLE OWNER

By:____________________________

Date:___________________________

SITE____________________ VEHICLE NUMBER______________

1. How many adults are there in your family? ____________

2. How many drivers are there? ____________

3. How many of these drivers are employed? ____________

4. How many children do you have living at home? ____________

5. Altogether, how many cars or other vehicles do you (and your family living with you) own or lease?

☐ 1. ONE ☐ 2. TWO ☐ 3. THREE ☐ 4. FOUR ☐ 5. FIVE OR MORE

6. How often is the car we are testing tuned up; according to the owner's manual, at least every 6 months, every 7 to 12 months, or less than once a year, or what?

☐ 5. TOO NEW TO BE TUNED → TURN TO P. 2, 7.

☐ 1. AT LEAST EVERY 6 MONTHS ☐ 2. 7 to 12 MONTHS ☐ 3. LESS THAN ONCE A YEAR ☐ 4. OWNERS MANUAL ☐ 7. OTHER (SPECIFY) __________

6a. How long ago was the last tune up, 6 months ago or less, 7 to 12 months, or longer than 12 months?

☐ 1. 6 MONTHS OR LESS ☐ 2. 7 TO 12 MONTHS ☐ 3. LONGER THAN 12 MONTHS

6b. Was the tune up done by a car dealer, a service station, an independent garage, you (or another family member), or someone else?

☐ 1. CAR DEALER ☐ 2. SERVICE STATION ☐ 3. INDEPENDENT GARAGE ☐ 4. SELF/OTHER FAMILY MEMBER ☐ 7. OTHER (SPECIFY) __________

7. We are interested in the fuel economy people actually get with their cars. How many miles per gallon do you get with this car in city driving?

______ MPG IN CITY

8. How about on the highway?

______ MPG ON HIGHWAY

9. Is unleaded gasoline usually used in this car?

☐ 1. YES ☐ 5. NO

9a. Is regular or premium used?

☐ 1. REGULAR ☐ 2. PREMIUM

GO TO 10

9b. Is regular, premium, or some other fuel used?

☐ 1. REGULAR ☐ 2. PREMIUM ☐ 7. OTHER

TURN TO P. 3, 11

10. Unleaded gas is more expensive than leaded and at times has been hard to find. Have you ever used leaded gasoline in this car?

☐ 1. YES ☐ 5. NO ☐ 8. DON'T KNOW

TURN TO P. 3, 11 →

10a. How often has leaded gasoline been used?____________________

11. Have any special modifications like installing high performance equipment been made to this car to improve its performance?

☐ 1. YES ☐ 5. NO ☐ 8. DON'T KNOW

GO TO 12

11a. What has been done? ______________________________

____

____

____

SRC THUMBNAIL SKETCH

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR MICHIGAN 48105

OFFICE OF
AIR, NOISE AND RADIATION

Dear Participant:

Thank you very much for your participation in our vehicle emission testing program. We are conducting a follow-up on this effort and would like your response to a few questions on the program. These may be answered after you have had a few days to become reacquainted with your vehicle. You may use this self-addressed franked envelope to submit your responses.

1. "Were you treated courteously and efficiently by the personnel at our contractor's laboratory?"

   Yes ☐ No ☐

2. "Do you feel that the performance of your vehicle is now different than when it was submitted for testing?"

   No noticeable change ☐

   Slightly better ☐ Slightly worse ☐

   Much better ☐ Much worse ☐

3. "Are you satisfied with the present performance of your vehicle?"

   Yes ☐ No ☐

We appreciate the time you have spent in completing this questionnaire. If you would like to receive a summary of the emission results on your vehicle, please fill in the name and address for mailing in the space below:

Name ______________________________

Street ______________________________ (Please

City, State ______________ Zip ______________ Print)

Any Other Comments?

Contractor Use:
Test Location ___ ______ Test Date __ ______ Run No. ________ Veh. No.____ ______

H NM

EG&G AUTOMOTIVE RESEARCH, INC
5404 BANDERA ROAD, SAN ANTONIO, TEXAS 78238 • TEL(512)684-2310 TWX 910-871-1075

Dear Participant:

This letter is to express my thanks to you for your recent participation in the exhaust emissions testing program which EG&G AUTOMOTIVE RESEARCH, INC., is conducting on behalf of the Environmental Protection Agency.

In addition to the tank of gas, savings bond and use of a loan car which you have received as incentives for your cooperation in this effort, we may have performed maintenance items on your vehicle according to the manufacturer's specifications. Attached for your records is a detailed summary of any maintenance performed on your car while in our laboratory.

Again, thank you very much for your kind cooperation in this important effort.

Sincerely,

Mark D. Dalen
Project Manager

MDD/bh

Attachment

EG&G AUTOMOTIVE RESEARCH, INC
5404 BANDERA ROAD, SAN ANTONIO, TEXAS 78238 • TEL(512)684-2310 TWX 910-871-1075

Dear Vehicle Owner:

Thank you for your response to our recent inquiry on your vehicle. This information will be valuable in our overall data gathering process.

Unfortunately, your vehicle does not meet all of the specifications and requirements for this particular study and can not be used in the actual testing phase at this time.

Again, we would like to express our appreciation for your timely response.

Sincerely,

Mark D. Dalen
Project Manager

MDD/bh

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 1		6

1) What is the brand name of the fuel you normally use (see list below)?		☐☐☐☐	(1-
2) Have you, or others, ever noticed a hydrogen sulfide (rotten eggs) odor in the vehicle exhaust?		1 (never) 2 (seldom) 3 (occasionally) 4 (frequently) 5 (don't know)	(5)
3) Have you ever used gasohol in this vehicle?		1 (never) 2 (seldom) 3 (occasionally) 4 (frequently) 5 (don't know)	(6)
4) If you have used gasohol,	a) Have you noticed any difference in the vehicle performance?	1 (never used gasohol) 2 (perf. is better) 3 (perf. is worse) 4 (no difference) 5 (don't know)	(7)
	b) Have you noticed any difference in fuel economy?	1 (never used gasohol) 2 (fuel economy better) 3 (fuel economy worse) 4 (no difference) 5 (don't know)	(8)
5) How long ago did you purchase the vehicle to be tested?		1 (0-3 months) 2 (3-12 months) 3 (1-2 years) 4 (over 2 years)	(9)

DATA ENTRIES FOR QUESTION #1

ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME	ENTER	BRAND NAME
AMOC	AMOCO	CLAR	CLARK	FINA	FINA	MOBI	MOBIL	SHEL	SHELL	UNIO	UNION
ARCO	ARCO	CONO	CONOCO	GEMC	GEMCO	MOTO	MOTOR	SINC	SINCLAIR	VICK	VICKERS
ASHL	ASHLAND	CROW	CROWN	GULF	GULF	PENN	PENNEYS	SITE	SITE	WARD	WARDS
BONA	BONAFIDE	DERB	DERBY	HESS	HESS	PHIL	PHILLIPS	SKEL	SKELLY	ZEPH	ZEPHYR
BP	BP	ENCO	ENCO	HUDS	HUDSON	SCOT	SCOTT	STAN	STANDARD	**	OTHER
CHEV	CHEVRON	ESSO	ESSO	MARS	MARS	SEAR	SEARS	SUNO	SUNOCO	UNKN	UNKNOWN
CITC	CITCO	EXXO	EXXON	MART	MARTIN	SHAM	SHAMROCK	TEXA	TEXACO	VARI	VARIOUS

** IF BRAND IS 'OTHER', THEN ENTER THE FULL BRAND NAME VEHICLE OWNER USES.

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 1		0 6

6) On a yearly basis, how many thousands of miles is this vehicle driven?		1 (0-5) 2 (5-10) 3 (10-15) 4 (15-20) 5 (20-30) 6 (over 30)	(10)
7) Where is the driving done? almost all: > 75% most: 75-51% some: 50-21% little or none: < 20%	a) City expressways	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(11)
	b) Major city streets	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(12)
	c) Other city streets	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(13)
	d) Rural expressways	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(14)
	e) Other rural roads	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(15)
8) How is the driving done? almost all: > 75% most: 75-51% some: 50-21% little or none: < 20%	a) To and from work	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(16)
	b) Shopping and errands	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(17)
	c) Business (not to and from work)	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(18)
	d) Other (social, vacations, etc.)	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(19)
9) How did you get here today?		1 (city streets only) 2 (some expressway) 3 (primarily expressways)	(20)
	Approx. miles	☐☐	(21-22)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEC	
IDENT	3 0 2 4	0 1	1 1		0 1		Q

10) How is this vehicle used? almost all: > 75% most: 75-51% some: 50-21% little or none: < 20%	a) Driver only	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(23)
	b) Driver and one passenger	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(24)
	c) Driver and 2 or more passengers	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(25)
	d) Driver only with heavy cargo	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(26)
	e) Driver, passenger and cargo	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(27)
	f) Towing a trailer	1 (almost all) 2 (most) 3 (some) 4 (little or none)	(28)
11) On a typical day, how many trips are made with this vehicle? (One trip is defined as starting the engine, traveling some distance and stopping the engine).		☐☐	(29-
12) On a weekly basis, how often is full throttle acceleration used?		1 (seldom) 2 (once or twice) 3 (3-6 times) 4 (every day)	(31)
13) Do you now experience any engine performance problems with this vehicle?	a) Hard starting	1 (yes) 2 (no)	(32)
	b) Stalling	1 (yes) 2 (no)	(33)
	c) Rough idle	1 (yes) 2 (no)	(34)
	d) Engine misfiring	1 (yes) 2 (no)	(35)
	e) Poor acceleration	1 (yes) 2 (no)	(36)
	f) Stumbling	1 (yes) 2 (no)	(37)
	g) Hesitation	1 (yes) 2 (no)	(38)
	h) Engine knock or ping	1 (yes) 2 (no)	(39)
	i) Dieseling (after run)	1 (yes) 2 (no)	(40)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEC	
IDENT	3 0 2 4	0 1	1 1		0 1		Q

14) Overall, are you reasonably satisfied with the engine performance of this vehicle?	1 (yes) 2 (most of the time) 3 (no)	(41)
15) How long ago was the last oil change?	1 (too new, not due) 2 (due, but not yet done) 3 (0-6 months ago) 4 (6-12 months ago) 5 (Over 1 year ago) 6 (don't know)	(42)
16) If you purchased the vehicle under warranty, how many times has it been returned for warranty repairs?	1 (no warranty) 2 (never returned) 3 (twice) 4 (3 or more) 5 (don't know)	(43)
17) What was the nature of the warranty repair?	1 (no warranty) 2 (never returned) 3 (recall) 4 (driveability) 5 (other)	(44)
18) Have you had any repairs to your vehicle for the correction of driveability problems?	1 (yes) 2 (no problems)	(45)
19) What repairs were performed on your vehicle to correct the driveability problems? Specify ______________________	1 (none) 2 (carburetor) 3 (engine) 4 (emission control system) 5 (ignition system) 6 (other) 7 (don't know)	(46)
20) How long ago were these repairs accomplished?	1 (no repairs) 2 (0-3 months) 3 (3-6 months) 4 (over 6 months) 5 (don't know)	(47)
21) Were these repairs effective in correcting the driveability problems?	1 (no repairs) 2 (yes) 3 (no)	(48)
22) Is this vehicle operated regularly on unpaved roads, in competitive events, or in hauling or transporting loads heavier than for which it was designed?	1 (yes) 2 (no) 3 (don't know)	(49)

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEC	
IDENT	3 0 2 4	0 1	1 1		0 1		2

23) Has the vehicle ever had major damage in any of the following areas?	a) Engine	1 (yes) 2 (no)	(50)
	b) Cooling system	1 (yes) 2 (no)	(51)
	c) Fuel system	1 (yes) 2 (no)	(52)
	d) Exhaust system	1 (yes) 2 (no)	(53)
	e) No damage	1 (yes) 2 (no)	(54)
	f) Don't know	1 (yes) 2 (no)	(55)
24) Has the catalytic converter ever been replaced on this vehicle?		1 (no catalyst) 2 (yes) 3 (no) 4 (don't know)	(56)
25) Was the vehicle tested in a previous EPA program?		1 (yes) 2 (no)	(57)
26) Was any maintenance performed since the last test?		1 (yes) 2 (no) 3 (not tested)	(58)
27) What type of maintenance was performed?		1 (warranty) 2 (tune-up) 3 (none) 4 (not tested)	(59)
28) How much did the maintenance cost? 001 : no maintenance 002 don't know 003: not tested		☐☐☐	(60-62)
29) Who performed the maintenance?		1 (no maintenance) 2 (dealer) 3 (independent garage) 4 (tune-up clinic) 5 (yourself) 6 (not tested)	

VEHICLE OWNER QUESTIONNAIRE
DATA SHEET

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEC	
IDENT	3 0 2 4	0 1	1 1		0 1		0

30) Do you accurately keep records of the fuel economy on this vehicle?		1 (yes) 2 (no)	(64)
31) Are you concerned with the fuel economy of this vehicle?		1 (yes) 2 (no)	(65)
32) Date of last city or state inspection 99/99 : don't know 98/98 : not required 00/00 : never inspected	a) Month	☐☐	(66-67)
	b) Year	☐☐	(68-69)
33) Did your vehicle pass or fail the inspection?		1 (pass) 2 (fail) 3 (don't know) 4 (not required) 5 (never inspected)	(70)
34) a) Does your odometer indicate the true number of miles on your car?		1 (yes) 2 (no)	(71)
b) If no, specify approximate total number of miles this vehicle has been driven.		☐☐☐☐☐☐	(72-77)

01
80

APPENDIX B

EPA Vehicle Data Packet

1) Vehicle Information Data Sheet
2) Engine Parameter Data Sheet
3) Vehicle Information Data Sheet
4) Mechanic's Inspection Form
5) FTP Test Data
6) Highway Fuel Economy Test Data Sheet
7) Bag Idle and 50 MPH Cruise Test Data Sheet
8) Four Mode and Loaded Two Mode Test Data Sheet
9) Propane Gain Data Sheet
10) Comments Data Sheet
11) Driveability Evaluation Data Sheet
12) Emission Component Data Sheet

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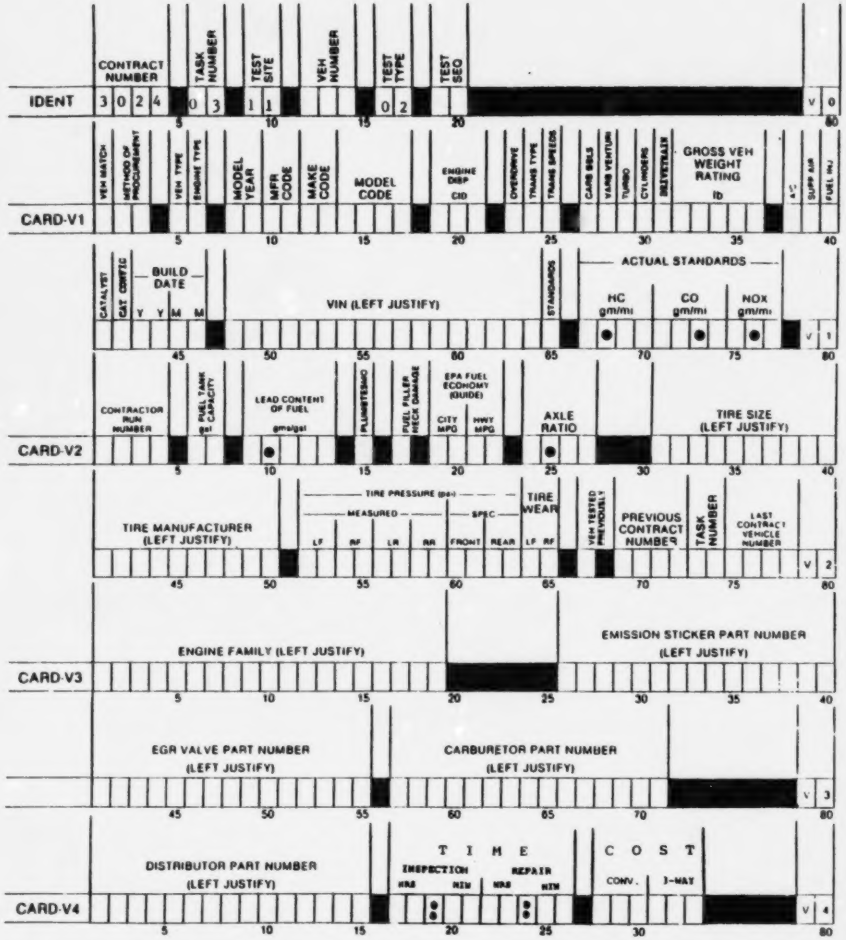
VEHICLE INFORMATION DATA SHEET



IDENT: CONTRACT NUMBER 3 0 2 4 | TASK NUMBER 0 3 | TEST SITE 1 1 | VEH NUMBER | TEST TYPE 0 2 | TEST SEQ | V 0

CARD-V1: VEH MATCH | METHOD OF PROCUREMENT | VEH TYPE | ENGINE TYPE | MODEL YEAR | MFR CODE | MAKE CODE | MODEL CODE | ENGINE DISP CID | OVERDRIVE | TRANS TYPE | TRANS SPEEDS | CARB BBLS | VARB VENTURI | TURBO | CYLINDERS | DRIVETRAIN | GROSS VEH WEIGHT RATING lb | A/C | SUPP AIR | FUEL INJ

CATALYST | CAT CONFIG | BUILD DATE Y Y M M | VIN (LEFT JUSTIFY) | STANDARDS | ACTUAL STANDARDS: HC gm/mi ● | CO gm/mi ● | NOX gm/mi ● | V 1

CARD-V2: CONTRACTOR RUN NUMBER | FUEL TANK CAPACITY gal | LEAD CONTENT OF FUEL gms/gal ● | PLUMBTESMO | FUEL FILLER NECK DAMAGE | EPA FUEL ECONOMY (GUIDE): CITY MPG | HWY MPG | AXLE RATIO ● | TIRE SIZE (LEFT JUSTIFY)

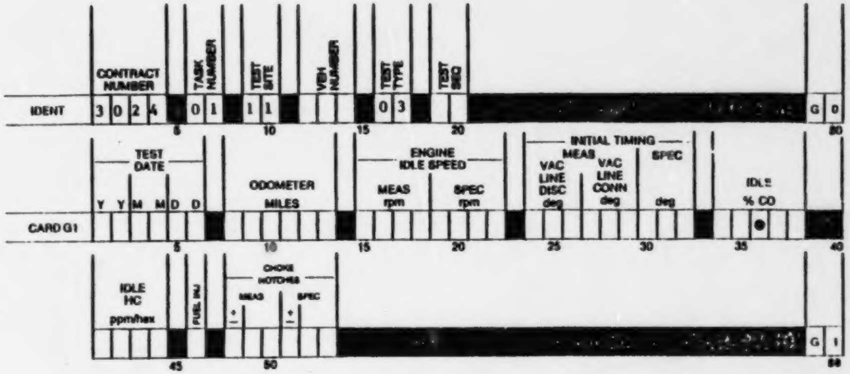
TIRE MANUFACTURER (LEFT JUSTIFY) | TIRE PRESSURE (psi): MEASURED LF | RF | LR | RR; SPEC FRONT | REAR | TIRE WEAR LF | RF | VEH TESTED PREVIOUSLY | PREVIOUS CONTRACT NUMBER | TASK NUMBER | LAST CONTRACT VEHICLE NUMBER | V 2

CARD-V3: ENGINE FAMILY (LEFT JUSTIFY) | EMISSION STICKER PART NUMBER (LEFT JUSTIFY)

EGR VALVE PART NUMBER (LEFT JUSTIFY) | CARBURETOR PART NUMBER (LEFT JUSTIFY) | V 3

CARD-V4: DISTRIBUTOR PART NUMBER (LEFT JUSTIFY) | T I M E: INSPECTION HRS ● MIN | REPAIR HRS ● MIN | C O S T: CONV. | 3-WAY | V 4

ENGINE PARAMETER DATA SHEET

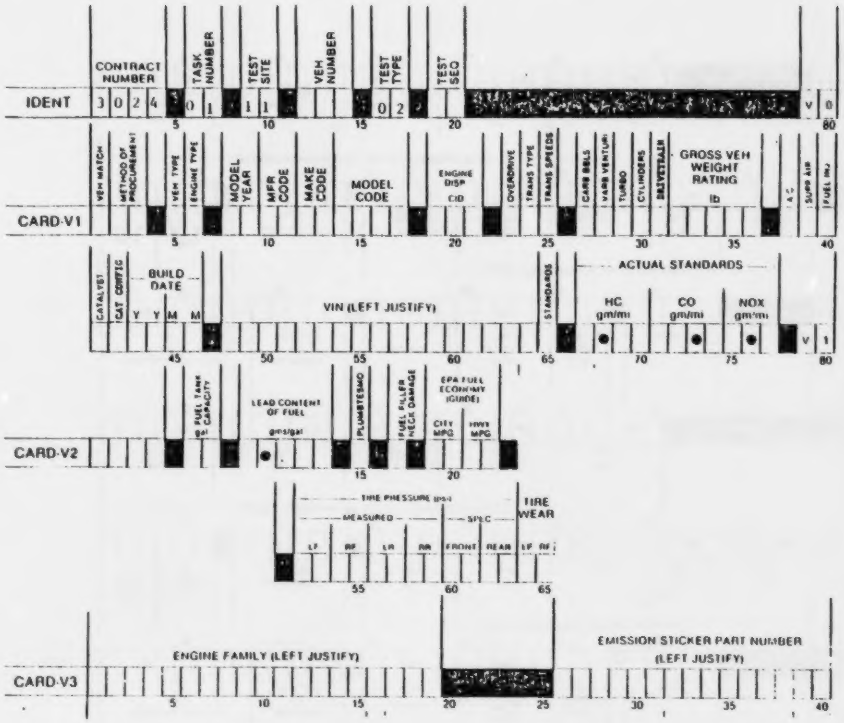


IDENT: CONTRACT NUMBER 3 0 2 4 | TASK NUMBER 0 1 | TEST SITE 1 1 | VEH NUMBER | TEST TYPE 0 3 | TEST SEQ | G 0

CARD G1: TEST DATE Y Y M M D D | ODOMETER MILES | ENGINE IDLE SPEED: MEAS rpm | SPEC rpm | INITIAL TIMING: MEAS VAC LINE DISC deg | VAC LINE CONN deg | SPEC deg | IDLE % CO ●

IDLE HC ppm/hex | FUEL INJ | CHOKE NOTCHES: MEAS ± | SPEC ± | G 1

VEHICLE INFORMATION DATA SHEET



IDENT: CONTRACT NUMBER 3 0 2 4 | TASK NUMBER 0 1 | TEST SITE 1 1 | VEH NUMBER | TEST TYPE 0 2 | TEST SEQ | V 0 (5, 10, 15, 20, 80)

CARD-V1: VEH MATCH | METHOD OF PROCUREMENT | VEH TYPE | ENGINE TYPE | MODEL YEAR | MFR CODE | MAKE CODE | MODEL CODE | ENGINE DISP CID | OVERDRIVE | TRANS TYPE | TRANS SPEEDS | CARB BBLS | VARB VENTURI | TURBO | CYLINDERS | DRIVETRAIN | GROSS VEH WEIGHT RATING lb | A C | SUPP AIR | FUEL INJ (5, 10, 15, 20, 25, 30, 35, 40)

CATALYST | CAT CONFIG | BUILD DATE Y Y M M | VIN (LEFT JUSTIFY) | STANDARDS | ACTUAL STANDARDS: HC gm/mi ● | CO gm/mi ● | NOX gm/mi ● | V 1 (45, 50, 55, 60, 65, 70, 75, 80)

CARD-V2: FUEL TANK CAPACITY gal | LEAD CONTENT OF FUEL gms/gal ● . | PLUMBTESMO | FUEL FILLER NECK DAMAGE | EPA FUEL ECONOMY (GUIDE) CITY MPG, HWY MPG (15, 20)

TIRE PRESSURE (psi): MEASURED LF, RF, LR, RR | SPEC FRONT, REAR | TIRE WEAR LF, RF (55, 60, 65)

CARD-V3: ENGINE FAMILY (LEFT JUSTIFY) | EMISSION STICKER PART NUMBER (LEFT JUSTIFY) (5, 10, 15, 20, 25, 30, 35, 40)

Control No.________
DATA FORM NO.3024.9
Page 1 of 12

MECHANICS INSPECTION FORM

VEHICLE NO.____________

Fuel Filler Neck Damage________

1 - Yes, Unleaded fuel vehicle
2 - No, Unleaded fuel vehicle
3 - N/A, Leaded fuel acceptable

AXLE RATIO____________________

TIRE SIZE____________________

TIRE MANUFACTURER________________

EGR VALVE PART NUMBER __________________(Includes all spaces, slashes, dashes, etc.)

CARBURETOR PART NUMBER__________________(Includes all spaces, slashes, dashes, etc.)

DISTRIBUTOR PART NUMBER__________________(Includes all spaces, slashes, dashes, etc.)

FTP AND EVAP TEST DATA SHEET

Page (1 of 2)

FTP TEST DATA

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 5		F 0

	INERTIA WEIGHT lbs	ROAD LOAD H.P.	EXTRA 10%	
CARD F1		•		F 1

	VOLUME OF GAS (Vo) ft^3	NUMBER OF REVOLS	BAROM "HG	INLET PRESS "HG	CVS TEMP °F	VMIX
BAG 1	•		•	•		

			CONCENTRATION OF DILUTION AIR					
WET BULB °F	DRY BULB °F	DISTANCE MILES	HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
		•	•	•	•	•	•	F 2

CONCENTRATION OF DILUTE EXHAUST SAMPLE				
HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm
•	•	•	•	•

	VOLUME OF GAS (Vo) ft^3	NUMBER OF REVOLS	BAROM "HG	INLET PRESS "HG	CVS TEMP °F	VMIX	
BAG 2	•		•	•			F 3

			CONCENTRATION OF DILUTION AIR				
WET BULB °F	DRY BULB °F	DISTANCE MILES	HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm
		•	•	•	•	•	•

CONCENTRATION OF DILUTE EXHAUST SAMPLE					
HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
•	•	•	•	•	F 4

FTP AND EVAP TEST DATA SHEET

Page (2 of 2)

FTP TEST DATA (continued)

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 5		F 0

	VOLUME OF GAS (Vo) ft^3	NUMBER OF REVOLS	BAROM "HG	INLET PRESS "HG	CVS TEMP °F	VMIX
BAG 3	•		•	•		

			CONCENTRATION OF DILUTION AIR					
WET BULB °F	DRY BULB °F	DISTANCE MILES	HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
		•	•	•	•	•	•	F 5

CONCENTRATION OF DILUTE EXHAUST SAMPLE					
HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
•	•	•	•	•	F 6

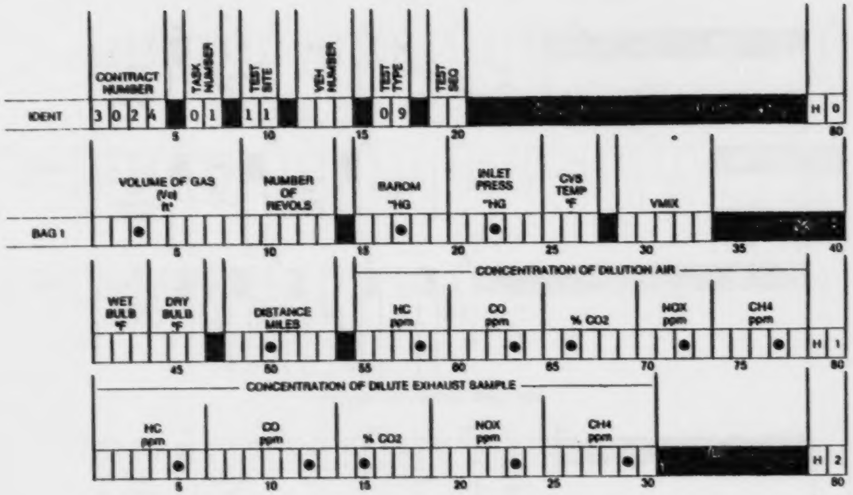
EVAP TEST DATA

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 6		E 0

		DIURNAL					
		HC CONC		BAROM PRESS		AMB TEMP	
	NET ENCLOSURE VOLUME ft^3	INIT ppmcarbon	FINAL ppmcarbon	INIT "HG	FINAL "HG	INIT °F	FINAL °F
CARD E1		•	•	•	•		

HOT SOAK						
HC CONC		BAROM PRESS		AMB TEMP		
INIT ppmcarbon	FINAL ppmcarbon	INIT "HG	FINAL "HG	INIT °F	FINAL °F	
•	•	•	•			E 1

HIGHWAY FUEL ECONOMY TEST DATA SHEET



	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 9		H 0

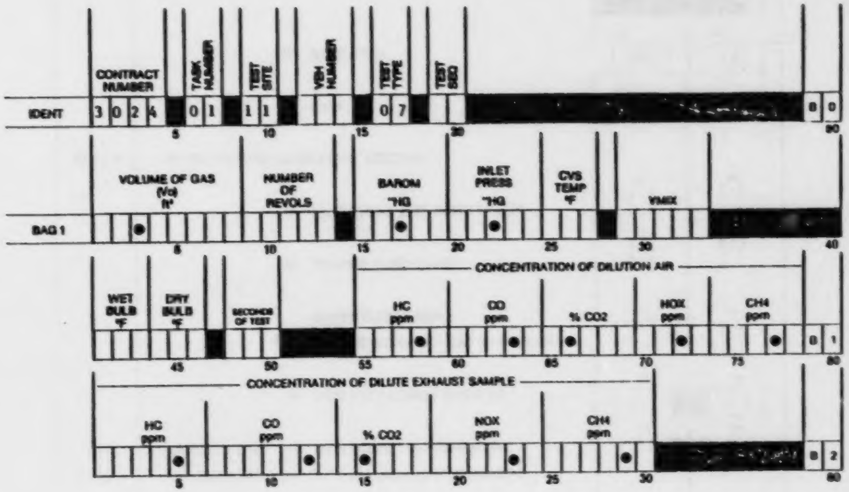
	VOLUME OF GAS (Vo) ft³	NUMBER OF REVOLS	BAROM "HG	INLET PRESS "HG	CVS TEMP °F	VMIX
BAG 1	●		●	●		

				CONCENTRATION OF DILUTION AIR					
	WET BULB °F	DRY BULB °F	DISTANCE MILES	HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
			●	●	●	●	●	●	H 1

CONCENTRATION OF DILUTE EXHAUST SAMPLE					
HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
●	●	●	●	●	H 2

BAG IDLE AND 50 MPH CRUISE TESTS DATA SHEET

BAG IDLE TEST DATA



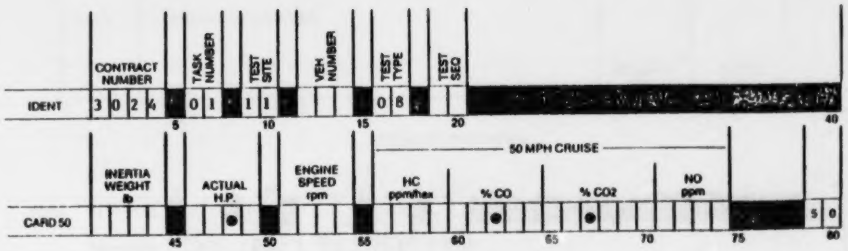
	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 7		B 0

	VOLUME OF GAS (Vo) ft³	NUMBER OF REVOLS	BAROM "HG	INLET PRESS "HG	CVS TEMP °F	VMIX
BAG 1	●		●	●		

				CONCENTRATION OF DILUTION AIR					
	WET BULB °F	DRY BULB °F	SECONDS OF TEST	HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
				●	●	●	●	●	B 1

CONCENTRATION OF DILUTE EXHAUST SAMPLE					
HC ppm	CO ppm	% CO2	NOX ppm	CH4 ppm	
●	●	●	●	●	B 2

50 MPH CRUISE DATA



	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ
IDENT	3 0 2 4	0 1	1 1		0 8	

				50 MPH CRUISE				
	INERTIA WEIGHT lb	ACTUAL H.P.	ENGINE SPEED rpm	HC ppm/hex	% CO	% CO2	NO ppm	
CARD 50		●			●	●		5 0

FOUR MODE IDLE AND LOADED TWO MODE TESTS DATA SHEET

FOUR MODE IDLE TEST DATA

IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ		
	3 0 2 4	0 1	1 1		1 0			M 0
	5		10		15	20		80

FIRST IDLE READING IN NEUTRAL

	ENGINE SPEED rpm	HC ppm/hex	% CO	% CO2	NO ppm	
CARD M1			●	●		
	5	10	15	20	25	40

2500 RPM

	HC ppm/hex	% CO	% CO2	NO ppm		
		●	●			M 1
45	50	55	60	65		80

SECOND IDLE READING IN NEUTRAL

	ENGINE SPEED rpm	HC ppm/hex	% CO	% CO2	NO ppm	
CARD M2			●	●		
	5	10	15	20	25	40

FINAL IDLE READING IN DRIVE

ENGINE SPEED rpm	HC ppm/hex	% CO	% CO2	NO ppm		
		●	●			M 2
45	50	55	60	65		80

LOADED TWO MODE TEST DATA

IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ		
	3 0 2 4	0 1	1 1		1 1			L 0
	5		10		15	20		80

30 MPH MODE

	INERTIA WEIGHT lbs	ACTUAL H.P.	ENGINE SPEED rpm	HC ppm/hex	% CO	% CO2	NO ppm	
CARD L1		●			●	●		
	5		10	15	20	25	30	40

IDLE MODE IN NEUTRAL

ENGINE SPEED rpm	HC ppm/hex	% CO	% CO2	NO ppm		
		●	●			L 1
45	50	55	60	65		80

PROPANE GAIN DATA SHEET

Page (1 of 2)

IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ		
	3 0 2 4	0 1	1 1		1 2			P 0
	5		10		15	20		80

3-WAY CLOSED LOOP

		IN NEUTRAL	IN DRIVE
STEP 1	PRESET FLOW RATE		
STEP 2	RECORD: a) FLOW RATE	☐ 1	☐ 2
	b) RPM	5	10
	c) IDLE %CO	● 15	● 20
STEP 3	INDUCE PROPANE, OBSERVE VEHICLE BEHAVIOR RECORD ONE: a) RPM RISES SMOOTHLY TO	25	30
	b) RPM FALLS SMOOTHLY TO	35	40
	c) ENGINE RUNS ROUGH AND THEN STABILIZES (1-YES)	☐ 43	☐ 44
	d) ENGINE DIES (1-YES)	☐ 45	☐ 46
	e) RPM STAYS THE SAME (1-YES)	☐ 47	☐ 48
STEP 4	WHEN ENGINE STABILIZES, RECORD:		
	a) RPM	50	55
	b) IDLE %CO	● 60	● 65
			P 1 80
	(Continues on Next Page)		

PROPANE GAIN DATA SHEET

Page (2 of 2)

	CONTRACT NUMBER		TASK NUMBER		TEST SITE		VEH NUMBER		TEST TYPE		TEST SEQ		
IDENT	3 0 2 4		0 1		1 1				1 2				P 0
	5				10		15				20		80

3-WAY CLOSED LOOP (Continued)

		IN NEUTRAL	IN DRIVE
STEP 5	WITHDRAW PROPANE, OBSERVE VEHICLE BEHAVIOR RECORD ONE: a) RPM RISES SMOOTHLY TO	☐☐☐☐ 5	☐☐☐☐ 10
	b) RPM FALLS SMOOTHLY TO	☐☐☐☐ 15	☐☐☐☐ 20
	c) ENGINE RUNS ROUGH AND THEN STABILIZES (1-YES)	☐ 21	☐ 22
	d) ENGINE DIES (1-YES)	☐ 23	☐ 24
	e) RPM STAYS THE SAME (1-YES)	☐ 25	☐ 26
STEP 6	WHEN ENGINE STABILIZES, RECORD:		
	a) RPM	☐☐☐☐ 30	☐☐☐☐ 35
	b) IDLE %CO	☐☐●☐ 40	☐☐●☐ 45
			P 2 80

VEHICLES OTHER THAN 3-WAY CLOSED LOOP

TRANS SPEC		RPM SPEC LEAN DROP OR PROPANE		IN DRIVE RPM W/O PROPANE	IN DRIVE RPM W/ PROPANE		IN NEUTRAL RPM W/O PROPANE	IN NEUTRAL RPM W/ PROPANE		IN NEUTRAL W/O PROPANE IDLE HC ppm	IN NEUTRAL W/O PROPANE IDLE %CO	
☐		☐☐☐☐		☐☐☐☐	☐☐☐☐		☐☐☐☐	☐☐☐☐		☐☐☐☐	☐☐●☐	P 3
	5		10		15	20		25	30		35	80

COMMENTS

	CONTRACT NUMBER		TASK NUMBER		TEST SITE		VEH NUMBER		TEST TYPE		TEST SEQ		
IDENT	3 0 2 4		0 1		1 1				1 4				N 0
	5				10		15				20		80

N 1

N 2

N 3

N 4

DRIVEABILITY EVALUATION DATA SHEET

IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ
	3 0 2 4	0 1	1 1		1 3	

AMBIENT TEMPERATURE °F	☐☐☐	(41-43)
ROAD CONDITION (1-DRY 2-WET 3-ICY 4-SNOW)	1 2 3 4	(44)

CONSTANT SPEED PHASE

NUMBER OF STALLS, PASS-OUTS UPON PART THROTTLE ACCELERATION TO ROAD SPEED	☐	(45)
ACCELERATION QUALITY	1 2 3 4 5	(46)
CRUISE QUALITY	1 2 3 4 5	(47)
SLIGHT ACCELERATION RESPONSE (PASSING)	1 2 3 4 5	(48)
IDLE QUALITY AT STOP WITH A/C 'ON'	1 2 3 4 5 9	(49)
IDLE QUALITY AT STOP WITH A/C 'OFF'	1 2 3 4 5	(50)

ACCELERATION FROM STOP PHASE

QUALITY OF ACCELERATION UNDER 1/4 THROTTLE	1 2 3 4 5	(51)
QUALITY OF ACCELERATION UNDER 1/2 THROTTLE	1 2 3 4 5	(52)
QUALITY OF ACCELERATION UNDER 2/3 THROTTLE	1 2 3 4 5	(53)
QUALITY OF ACCELERATION UNDER 3/4 THROTTLE	1 2 3 4 5	(54)

RESTART PHASE

CRANKING TIME TO START AFTER 10 MIN (IN SECONDS)	☐☐	(55-56)
IDLE QUALITY AFTER RESTART	1 2 3 4 5	(57)

COLD START AND IDLE PHASE (DYNAMOMETER)

INITIAL CRANKING TIME (IN SECONDS)	☐☐	(58-59)
NUMBER OF ENGINE IDLE-OUTS AFTER START	☐	(60)
NUMBER OF ENGINE STALLS AFTER GEAR SELECTION	☐	(61)
HESITATION, LAG UPON SLIGHT ACCELERATION (1-YES 2-NO)	1 2	(62)
IDLE QUALITY	1 2 3 4 5	(63)

DRIVE AWAY PHASE (DYNAMOMETER)

NUMBER OF STALLS, PASS-OUTS UPON SLIGHT ACCELERATION TO ROAD SPEED	☐	(64)
ACCELERATION QUALITY	1 2 3 4 5	(65)
IDLE QUALITY AFTER 0.2 MILE FROM STOP	1 2 3 4 5	(66)
NUMBER OF STALLS, PASS-OUTS UPON SLIGHT ACCELERATION TO ROAD SPEED	☐	(67)
ACCELERATION QUALITY	1 2 3 4 5	(68)
IDLE QUALITY AFTER 0.4 MILES FROM STOP	1 2 3 4 5	(69)
	D D	(79-80)

QUALITY CODE
9=IF NOT EQPD, 5=EXCELLENT, 4=GOOD, 3=FAIR, 2=POOR, 1=FAIL

EMISSION COMPONENTS DATA SHEET

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IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
	3 0 2 4	0 1	1 1		0 4		1 0

	SUB SYS PERF CODE	SUB SYS COMPONENT CODE	SYS PERF CODE
INDUCTION SYSTEM			
a) HEATED AIR DOOR ASSEMBLY			
b) TEMPERATURE SENSORS			
c) AIR FILTER ELEMENT			
d) HOSES			
e) OTHER			
CARBURETOR AND FUEL SYSTEM - FUEL SUBSYSTEM			
a) CARBURETOR ASSEMBLY			
b) IDLE MIXTURE ADJUSTMENT LIMITING DEVICE			
c) IDLE MIXTURE			
d) IDLE SPEED			
e) IDLE SPEED SOLENOID			
f) FUEL INJECTION COMPONENTS			
g) HOSES, LINES, WIRES			
h) OTHER			
			C 1

EMISSION COMPONENTS DATA SHEET Page 12 of 61

IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ		
	3 0 2 4	0 1	1 1		0 4			1 0
								80

	SUB SYS PERF CODE	SUB SYS COMPONENT CODE	SYS PERF CODE	
CARBURETOR AND FUEL SYSTEM - CHOKE SUBSYSTEM				5
a) CHOKE ADJUSTMENT (NOTCHES)				10
b) CHOKE ADJUSTMENT (VACUUM BREAK)				15
c) CHOKE ADJUSTMENT LIMITING DEVICE				20
d) FAST IDLE SPEED				25
e) VACUUM DIAPHRAGMS				30
f) ELECTRICAL CONTROLS				35
g) EXHAUST HEAT CONTROL VALVE ASSEMBLY				40
h) HOSES, LINES, WIRES				45
i) OTHER				50
				55
				60
				65
				70
				75
			C 2	80

EMISSION COMPONENTS DATA SHEET Page 11 of 61

IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ		
	3 0 2 4	0 1	1 1		0 4			1 0
								80

	SUB SYS PERF CODE	SUB SYS COMPONENT CODE	SYS PERF CODE	
IGNITION SYSTEM				5
a) DISTRIBUTOR ASSEMBLY				10
b) INITIAL TIMING				15
c) INITIAL TIMING LIMITING DEVICE				20
d) SPARK PLUGS AND WIRES				25
e) VACUUM ADVANCE ASSEMBLY				30
f) SPARK DELAY DEVICES				35
g) SPARK KNOCK DETECTOR				40
h) ELECTRONIC TIMING MODULE				45
i) COOLANT TEMPERATURE SENSORS (TVS)				50
j) HOSES, LINES, WIRES				55
k) OTHER				60
				65
				70
				75
			C 1	80

EMISSION COMPONENTS DATA SHEET

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IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEC	
	3 0 2 4	0 1	1 1		0 4		0

	SUB SYS PERF CODE	SUB SYS COMPONENT CODE	SYS PERF CODE	
EGR SYSTEM				5
a) EGR VALVE ASSEMBLY				10
b) BACK PRESSURE TRANSDUCER				15
c) DELAY SOLENOID				20
d) VACUUM AMPLIFIER				25
e) VACUUM RESERVOIR				30
f) COOLANT TEMPERATURE SENSOR (TVS)				35
g) HOSES, LINES, WIRES				40
h) OTHER				45
				50
				55
				60
				65
				70
				75
			C 4	80

EMISSION COMPONENTS DATA SHEET

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IDENT	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEC	
	3 0 2 4	0 1	1 1		0 4		0

	SUB SYS PERF CODE	SUB SYS COMPONENT CODE	SYS PERF CODE	
AIR INJECTION SYSTEM				5
a) AIR INJECTION ASSEMBLY				10
b) AIR BYPASS VALVE				15
c) AIR DIVERTER VALVE				20
d) CHECK VALVE				25
e) DRIVE BELT				30
f) HOSES, LINES, WIRES				35
g) OTHER				40
PCV SYSTEM				45
a) PCV VALVE				50
b) PCV FILTER				55
c) HOSES				60
d) OTHER				65
				70
				75
			C 5	80

EMISSION COMPONENTS DATA SHEET

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	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 4		[illegible] 0

	SUB SYS PERF CODE	SUB SYS COMMENT CODE	SYS PERF CODE
EXHAUST SYSTEM			
a) MANIFOLD, TAILPIPE, MUFFLERS			
b) CATALYST			
c) OTHER			
EVAPORATIVE CONTROL SYSTEM			
a) CANISTER			
b) CANISTER FILTER			
c) CANISTER PURGE SOLENOID/VALVE			
d) HOSES, LINES, WIRES			
e) OTHER			
ENGINE ASSEMBLY			
a) ENGINE ASSEMBLY			
b) COOLING SYSTEM			
c) VALVE ADJUSTMENT			
d) BELT TENSIONS			
e) HOSES, LINES, WIRES			C 6

EMISSION COMPONENTS DATA SHEET

Page [illegible]

	CONTRACT NUMBER	TASK NUMBER	TEST SITE	VEH NUMBER	TEST TYPE	TEST SEQ	
IDENT	3 0 2 4	0 1	1 1		0 4		[illegible] 0

	SUB SYS PERF CODE	SUB SYS COMMENT CODE	SYS PERF CODE
f) OTHER			
3-WAY SYSTEM			
a) ELECTRONIC CONTROL UNIT			
b) OXYGEN SENSOR			
c) BAROMETRIC PRESSURE SENSOR			
d) LOAD SENSOR (THROTTLE POSITION, MANIFOLD VACUUM, ETC.)			
e) ENGINE SPEED SENSOR			
f) COOLANT TEMPERATURE SENSOR			
g) CRANKSHAFT POSITION SENSOR			
h) EGR POSITION SENSOR			
i) EGR CONTROL SOLENOID(S)			
j) AIR/FUEL CONTROL ACTUATOR (SOLENOID, STEPPER MOTOR)			
k) AIR BYPASS SOLENOID/VALVE			
l) AIR DIVERTOR SOLENOID/VALVE			
m) THROTTLE KICKER ACTUATOR			
n) IDLE SPEED CONTROL SYSTEM			C 7

EMISSION COMPONENTS DATA SHEET Page (8 of 8)

	CONTRACT NUMBER		TASK NUMBER		TEST SITE		VEH NUMBER		TEST TYPE		TEST SEQ		
IDENT	3 0 2 4		0 1		1 1				0 4				1 0

	SUB SYS PERF CODE	SUB SYS COMPNENT CODE	SYS PERF CODE
o) HOSES, LINES, WIRES			
p) DIAGNOSTIC BULB CHECK			
q) DIAGNOSTIC WARNING			
r) DIAGNOSTIC SYSTEM CODE(S)			
s) OTHER			
			C 8

APPENDIX C

Lab Qualification Worksheets

1) Facility Inspection
2) Dynamometer Inspection
3) Driver's Aide Inspection
4) Analytical System Checks
5) Hydrocarbon Analyzer A (Low Ranges)
6) Hydrocarbon Analyzer B (High Ranges)
7) Carbon Monoxide Analyzers A (Low Ranges)
8) Carbon Monoxide Analyzers B (High Ranges)
9) Carbon Dioxide Analyzer
10) Constant Volume Sampling System Inspection
11) Oxides of Nitrogen Analyzer
12) Methane Analyzer
13) Raw Exhaust Hexane Analyzer
14) Raw Exhaust CO Analyzer
15) Raw Exhaust CO_2 Analyzer
16) Raw Exhaust NO Analyzer
17) Sealed Housing for Evaporative Determination
18) Temperature Recording - Auxilliary Devices
19) Record Keeping System Check
20) List of Documents to be included in the Lab Qualification Packet
21) General Comments

Facility Inspection

	Yes/ Pass	No/ Fail	Corrected
1. Test Site San Antonio, Texas			
2. Contractor EG&G Automotive Research, Inc.			
3. Date of inspection December 11, 1980			
4. Inspector Butch Naegelin			
5. Contractor personnel			
a. M. Dalen d. J. Rivenburgh g. C. Jackel j. L. Hernandez			
b. M. Forshee e. R. Martinez h. R. Gilmore k. S. Gearhart			
c. B. Naegelin f. B. Martinez i. C. VanTassel			
6. Test area of adequate size?	X		
7. Soak area of adequate size? Number of vehicles 12-14	X		
8. Soak area temperature between 68°F and 86°F? 72 °F	X		
Distance from soak area to dynamometer 0 + ft same building.			
10. Soak area free of precipitation?	X		
11. Laboratory floor area? 4547 sq ft			
12. Laboratory air conditioned? 73 ± 5 °F	X		
a. Air conditioning capacity 56 tons	X		
13. Laboratory humidity controlled? 72 ± 5 Grains TC-2 only		X	
14. Laboratory elevation 830 ft			
15. Office space 723 ft^2			
16. Test fuel			
a. Does leaded fuel meet all specs? (Attach analysis)	X		
b. Does unleaded fuel meet all specs? (Attach analysis)	X		

	Yes/ Pass	No/ Fail	Corrected
c. Are fuel containers clearly identified?	X		
d. Are separate systems used for leaded and unleaded fuels?	X		
e. Is the fuel dispensing system accurate within 2%?	X		
f. Storage area and temperature 55 ± 5 °F	X		
17. Gas Cylinders.			
a. Storage area of adequate size?	X		
b. Temperature of area (60°F-86°F) 65 ± 10 °F		X	
c. Are cylinders secured?	X		
d. Is each cylinder equipped with a regulator? Only cylinders in-use.		X	
e. Are cylinder considered empty at 100 Psi?	X		
18. Lead Analysis			
a. Make and model Scientic Glass & Instruments/ 33060	X		
b. Work area adequate to perform analysis?	X		
c. Good laboratory techniques utilized?	X		

Comments:

Gas cylinder storage reaches low of 55°F at low ambient temperatures.

Contractor EG&G Automotive Research, Inc. Site San Antonio, Texas

- pared by Butch Naegelin date: [illegible]

Submitted by Mark Dalen date: [illegible]

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namometer Inspection

	Yes/ Pass	No/ Fail	Corrected
1. Make and model Clayton ECE-50	X		
2. Is dynamometer equipped with direct drive inertia assembly?	X		
3. Is dynamometer equipped with 125 lb. increment inertia wts?	X		
4. Is dynamometer equipped with 50 Hp. power absorber unit?	X		
5. Are dynamometer rolls 8.65" dia., 78" long, and on 17.25" centers and not damaged?	X		
6. Is dynamometer calibration kit used?	X		
7. Is dynamometer horsepower calibrated in accordance with the requirements of the contract?	X		
8. Horsepower meter accurate and readable to 0.25 hp or less?	X		
9. Check speedometer-actual vs. indicated using a Strobotach. For ECE 50, 46.3 mph= 1800 rpm, 45 mph= 1750 rpm, 55 mph= 2140 rpm	X		
10. Tach. generator located on rear roll?	X		
11. Vehicle restraint cable available?	X		
12. Is dynamometer equipped to measure actual distance traveled?	X		
13. Capacity of fixed speed cooling fan shall be 5300 CFM (Hartzell Model N24DWW or equiv.) and positioned 6-12" in front of vehicle with hood open during testing?	X		

Comments:

tractor: EG&G Automotive Research, Inc. Site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12 11-8.

Submitted by: Mark Dalen date: .2 11-8.

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iver's Aid Inspection

	Yes/ Pass	No/ Fail	Corrected
Make and model. – Hewlatt Packard 7133 (A)	X		
Check elapsed time for complete LA-4 test with accurate stop watch. (Tolerance 1.0 sec or less) Cell #1 Serial # 1060A00302	X		
a. Stopwatch time 1873.63 sec			
b. Chart time 1874 sec			
Zero and span driver's aid, check after test (± 1 mph) 1.0 mph	X		
Zero and span driver's aid, check after test (± 1 ihp) .5 ihp	X		
Are drivers aid strip charts within ±1 mph and ±1.0 sec. for all driving cycles?	X		
Chart width 11 in	X		
Chart speed 4 cm/min in/min	X		
Scale 12 mph/in miles/inch	X		

omments:

#2 Drivers aid Serial # 1606A00301

Cell #2

A Stopwatch Time: 1873.06

B Chart Time: 1874.00

.94 sec. X

ontractor: EG&G Automotive Research, Inc. Site: San Antonio, Texas

repared by: Butch Naegelin date: 12 11 8.

ubmitted by: Mark Dalen date: 12 11 8.

Analytical System Checks

		Yes/ Pass	No/ Fail	Corrected
1.	Check for leaks in the system using daily procedure.	X		
2.	Is the system plumbing either stainless steel or teflon?	X		
3.	Is system leak check done before and after each test?	X		
4.	Are bags purged, evacuated, and leak checked before each use?	X		
5.	Are sample filters changed before each test?		N/A	
6.	Are zero and span gas traces identified before and after each analysis?	X		
7.	Is NO_x analyzer spanned through converter?	X		
8.	Are all samples analyzed on the lowest available range?	X		
9.	Are analyzer flows the same for calibration and sample analysis?	X		
10.	Are samples analyzed within 20 minutes of end of test?	X		
11	Do the analyzers stay in calibration throughout the test? (±1% FS)	X		
12.	Is dilution air less than 30 ppm Carbon (less than 10 ppm C for 1975 and later model year vehicles): ≤ 10 ppm	X		
13.	Is dilution air 10 ppm CO for 1977 and later model year tests? ≤ 5 ppm	X		
14.	For 3-way catalyst vehicle testing is dilution air concentration of HC and CO less than or equal to the applicable sample?	X		
15.	What are typical dilution air levels (ppm) ? 9.0 Carbon 1.3 CO 1.1 CO_2 0.2 NO_x			
16.	Is system purged continually with air or nitrogen between emission tests to reduce hang-up?	X		
17.	Is analytical system exhaust properly vented outside the laboratory?	X		

Comments:

Contractor: EG&G Automotive Research, Inc. Site: San Antonio, Texas

Prepared by: Butch Haegelin Date: 12 11 80

Submitted by: Mark Dalen Date: 12 11 80

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rocarbon analyzer A (Low Ranges)

		Yes/ Pass	No/ Fail	Corrected
1.	Make and model Horiba FIA-23A with OPE-415	X		
2.	Use prepurified air for zero gas - carbon less than 1ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x less than .1 ppm, Mfr. AADCO clean air generator 0.1 ppm C	X		
3.	Prepurified air used for combustion? Mfr. Liquid carbonics	X		
4.	Calibration gases cover all ranges?	X		
5.	Analyzed span gas available for each range? (80% FS)min	X		
6.	Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	X		
7.	Approved peaking procedure used?		N/A	
8.	Fuel pressure (H_2-N_2) 1.0 - 1.5 kg/cm^2			
9.	Fuel source pressure 20 psi			
10.	Air pressure 1.0 - 1.5 kg/cm^2			
11.	Air source pressure 14 psi			
12.	Sample pressure 6.0 psi			
13.	Response time (zero gas to 90% span point) (less than 3 sec) 2 sec	X		
14.	Zero gas 5% scale return time from span point (less than 5 sec) 1.7 sec	X		
15.	Analyzer range(s) 0- 100 , 0- 500 , 0- 1000, 0-5000			
16.	Sample bypass flow rate 6 cfh			
17.	Stability check @ zero and span point Enter max. variation after 10 mins. (±1% FS Range 0-100 Zero 0 %FS Span .1 % FS	X		

Comments:

Contractor: EG&G Automotive Research, Inc. Site: San Antonio, Texas

Prepared by: Butch Haegelin Date: 12 11 8[illegible]

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Hydrocarbon analyzer B (high ranges)

	Yes/ Pass	NO/ Fail	Corrected
1. Make and model Horiba FIA-23A with OPE-415	X		
2. Use prepurified air for zero gas - Carbon less than 1 ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x less than 1 ppm. Mfr. AADCO Clean Air Generator 0.1 ppm C	X		
3. Prepurified air used for combustion? Mfr. Liquid carbonics	X		
4. Calibration gases cover all ranges?	X		
5. Analyzed span gas available for each range? (80% FS) min	X		
6. Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	X		
7. Approved peaking procedure used?		N/A	

8. Fuel pressure (H_2-N_2) 1.0 - 1.5 kg/cm^2

9. Fuel source pressure 20 psi

10. Air pressure 1.0 - 1.5 kg/cm^2

11. Air source pressure 14 psi

12. Sample pressure 6.0 psi

	Yes/ Pass	NO/ Fail	Corrected
13. Response time (zero gas to 90% span point) (less than 3 sec) 2 sec	X		
14 Zero gas 5% scale return time from span point (less than 5 sec) 1.7 sec	X		

15. Analyzer range(s) 0-100 ,0-500 ,0-1000, 0-5000

16. Sample bypass flow rate 6 cfm

	Yes/ Pass	NO/ Fail	Corrected
17. Stability check @ zero and span point Enter max. variation after 10 mins. (±1% FS) Range 0-100 Zero 0 % FS Span .1 %FS	X		

Comments:

Contractor: EG&G Automotive Research, Inc. Site San Antonio, Texas

Prepared by: Butch Naegelin date 12 11 80

Submitted by: Mark Dalen date 12 11 80

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[1] on Monoxide Analyzers A (Low Ranges)

	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba AIA-23-AS	X		
. Flow rates Bypass 5 cfm, Sample 5 cfm			
. Check for CO_2 and H_2O interference using wet 3% CO_2 cal. gas (less than 3 ppm on 100 ppm CO range) 0 ppm	X		
. Do calibration gases cover all ranges?	X		
. Analyzed span gas available for each range? (80% FS)	X		
. Use prepurified air on N_2 for zero gas. Concentration CO less than 1 ppm, CO_2 less than 400 ppm, carbon less than 1 ppm, NO_x less than 0.1 ppm. Mfr. AADCO .01 ppm	X		
. Check curve at seven (7) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	X		
. Response time (Zero gas to 90% span point) (less than 5 sec) 8.74 sec	[1] N/A		
. Zero gas 5% scale return time from span point (less than 5 sec) 11.26 sec	[1] N/A		
0. Analyzer range(s) 0-100 , 0-500, 0-1000, 0-5000			
1. Stability checks @ Zero and span point Enter max. variation after 10 mins. (±1% FS) Range 0-100 Zero 0 % FS Span ± .1 %F.S.	X X		

omments:

[1] The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine there response times.

ctor: EG&G Automotive Research, Inc. Site: San Antonio, Texas

epared by: Butch Naegelin date: 12 11 80

bmitted by: Mark Dalen date: 12 11 80

Carbon Monoxide Analyzer B (High Ranges)

		Yes/ Pass	No/ Fail	Corrected
1	Make and model See Carbon Monoxide Analyzer A			
2.	Flow rates Bypass ____ cfm, Sample ____ cfm			
3.	Check for CO_2 and H_2O interference using wet 3% CO_2 cal. gas (less than 1% FS on 3000 ppm CO range) ____ ppm			
4.	Do calibration gases cover all ranges			
5.	Analyzed span gas available for each range? (80% FS)			
6.	Use prepurified air or N_2 for zero gas. Concentration CO less than 1 ppm, CO_2 less than 400 ppm, carbon less than 1 ppm, NO_x less than 0.1 ppm Mfr. ____ ____ ppm CO			
7.	Check curve at seven (7) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.			
8.	Response time (Zero gas to 90% span point) (less than 5 sec) ____ sec			
9.	Zero gas 5% scale return time from span point (less than 5 sec) ____ sec			
10.	Analyzer range(s) 0- ____ ,0- ____ ,0- ____			
11.	Stability check @ zero and span point. Enter max.variation after 10 mins. (±1% FS) Range 0- ____ Zero ____ % FS Span ____ %FS			

Comments:

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12 11 80

Submitted by: Mark Dalen date: 12 11 80

Carbon Dioxide Analyzer

		Yes/ Pass	No/ Fail	Corrected
1.	Make and model Horiba AIA-23A	X		
2.	Flow rates Bypass 6 cfm, Sample 6 cfm	X		
3.	Calibration gases cover all ranges?	X		
4.	Analyzed span gas available for each range? (80% FS)	X		
5.	Use prepurified air or N_2 for Zero gas concentration CO less than 1 ppm, CO_2 less than 400 ppm, carbon less than 1 ppm, NO_x less than 0.1 ppm Mfg. Liquid Carbonic ≤400 ppm CO_2	X		
6.	Check curve at seven (7) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.	X		
7.	Response time (zero gas to 90% of span point) (less than 4 sec) 7.3 sec	[1] N/A		
8.	Zero gas 5% scale return time from span point (less than 5 sec) 9.23 sec	[1] N/A		
9.	Analyzer range(s) 0-1.5%,0-4.0% ____			
10.	Stability check @ zero and span point Enter max. variation after 10 mins (±1% FS)(Range 0-1.5%)Zero .1 % FS Span 0 %FS	X		

Comments:

[1] The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine there response times.

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12 11 80

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st : Volume Sampling System Inspection

		Yes/ Fail	No/ Pass	Corrected
1.	Make and model Horiba CVS 20B			
2.	Submit all pertinent data obtained during laminar flow element calibration.			
3.	Where is the source of the CVS dilution air ? Cell #1	x		
4.	What is the total flow capacity of the CVS? (Min 325 cfm) 338 cfm	x		
5.	What is CVS sample bag flow rate? (Min 10 cfh) 15.75 cfh	x		
6.	What is CVS background bag flow rate (Min 10 cfh) 15.75 cfh	x		
7.	Check static pressure at mixing point of dilution air and exhaust sample. Pressure should be less than 1" H_2O below ambient when the CVS is operating at its maximum flow rate. 0.5 "H_2O	x		
8.	Check static pressure at the vehicle tailpipe. Pressure shall be less than ± 5" H_2O as referenced in 39 Federal Register 101 Section 85.075-20 (b) (2). .5 "H_2O	x		
9.	Propane Recovery Test			
a.	Recovery shall be within ±2.0% of injected volume -0.87 % -0.86 %	x		
b.	Instrument grade propane used? Mfr. Liquid Carbonic	x		
c.	Make and model of balance used (Accuracy within ± 0.1 grams) Mettler P1210	x		
d.	Is upper third of 0- 500ppm carbon range used? 90.1 def . 81.4 def	x		
e.	Submit all pertinent data.	x		
10.	Stainless steel convoluted tubing between vehicle and CVS as short as possible?	x		
11.	Are CVS sample bags made of tedlar and of sufficient size not to restrict sample flow?	x		

Comments:

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12-11-80

Submitted by: Mark Dalen date: 12-11-80

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xides of Nitrogen Analyzer

		Yes/ Pass	No/ Fail	Corrected
1.	Make and model Horiba CLA-22	x		
2.	Flow rates O_2 N/A psi Internal Bypass N/A cfh External Bypass (if used) 6 cfh	x		
3.	Sample pressure/reactor vacuum N/A psi/ N/A torr/mm		N/A	
4.	Use prepurified nitrogen or air for zero gas. Concentration NO_x (less than 0.1 ppm) <.1 ppm NO_x	x		
5.	Calibration gases cover all ranges?	x		
6.	Are NO_x cylinder regulators corrosion resistant?	x		
7.	Analyzed span gas available for each range? (80% FS)	x		
8.	Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller	x		
.	Spanned through the converter?	x		
10.	Response times (zero gas to 90% of span point) (5 sec max)			
a.	Through Converter 2.2 sec	x		
b.	Bypass converter 1.8 sec	x		
11.	Zero gas 5% scale return time from span point. (must be 5 sec or less) 4.0 sec	x		
12.	Analyzer range(s) 0- 100 ,0- 300,0-1000,0-			
13.	Check converter efficiency (95% ± 5%)? 98 % 1 %	x		
14.	Is NO_x converter efficiency detector used?	x		
15.	Is converter efficiency check performed daily?	x		
16.	Stability Check @ Zero and span point. Enter max. variation after 10 minutes - (±1% FS) Range 0- 100 Zero .1 % FS Span .1 %FS	x		

Comments:

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12-11-80

Submitted by: Mark Dalen date: 12-11-80

Methane Analyzer

	Yes/ Pass	No/ Fail	Corrected
1. Make and model ________			
2. Use prepurified air for zero gas - Carbon less than 1 ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x - less than 0.1 ppm. Mfg. ________ ____ ppm			
3. Prepurified air used for combustion? Mfg. ____			
4. Calibration gases cover all ranges?			
5. Analyzed span gas available for each range? (80% FS)			
6. Check curve at three (3) points across each range calibration shall be within ± 1% of full scale or ±5% of measured value, whichever is smaller.			
7. Approved peaking procedure used?			

8. Fuel pressure (H_2 - H_e) ____ psi

9. Fuel source pressure ____ psi

10. Air pressure ____ psi

11. Air source pressure ____ psi

12. Sample pressure ____ psi

13. Analyzer range 0- ____ , 0- ____ , 0- ____

14. Method of reading output of analyzer ________

Comments:

N/A

Contractor: EG&G Automotive Research, Inc. Site: San Antonio, Texas

Prepared by: Butch Maegelin date: 12 11 80

Submitted by: Mark Dalen date: 12 11 80

Raw Exhaust [illegible] Analyzer

	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba Mexa 321 E	X		
2. Flow rates Sample 6 cfh			
3. Calibration gases cover all ranges?	X		
4. Analyzed span gas available for each range? (80% FS)	X		
5. Use prepurified nitrogen or air for Zero gas 0.1 ppm C	X		
6. Check curve at 6 points across each range. Calibration shall be within ±2% of full scale or ±10% of measured value, whichever is smaller.	X		
7. Response time (zero gas to 90% of span point) (less than 5 sec) 3 sec	X		
8. Zero gas 5% scale return time from span point (less than 5 sec.) 2 sec	X		

- Analyzer range(s) 0- 500 , 0- 2000

Comments:

N/A

Contractor: EG&G Automotive Research, Inc. Site: San Antonio, Texas

Prepared by: Butch Maegelin date: 12 11 80

Submitted by: Mark Dalen date: 12 11 80

Raw Exhaust CO Analyzer

	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba AIA-23-A	X		
2. Flow rates sample 5 cfh	X		
3. Check for CO_2 and H_2O interference using wet 8% CO_2 cal. gas (less than 1% FS on .5% CO range) 0 ppm % FS	X		
4. Calibration gases cover all ranges?	X		
5. Analyzed span gas available for each range? (80% FS)	X		
6. Use prepurified air or N_2 for zero gas (Concentration CO less than 1 ppm) Mfr. AADCO ≤.1 ppm	X		
7. Check curve at 7 points across each range. Calibration shall be withing ±2% of full scale or ±10% of measured value, whichever is smaller	X		
. Response time (Zero gas to 90% span point) (less than 5 sec) 6.2 sec	[1] N/A		
9. Zero gas 5% scale return time from span point (less than 5 sec) 6.9 sec	[1] N/A		

10. Analyzer range (s) 0-2.0% ,0- 10.0%

Comments:

[1] The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine there response times.

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas
Prepared by: Butch Naegelin date: 12 11 80
Submitted by: Mark Dalen date: 12 11 8

Raw Exhaust CO_2 Analyzer

	Yes/ Pass	No/ Fail	Corrected
1. Make and model Horiba AIA-23A	X		
2. Flow rates Sample 5 cfh	X		
3. Calibration gases cover all ranges?	X		
4. Analyzed span gas available for each range?	X		
5. Use prepurified nitrogen or air for zero gas .1 ppm CO_2	X		
6. Check curve at 7 points across each range. Calibration shall be within ±2% of full scale or ±10% of measured value, whichever is smaller.	X		
7. Response time (zero gas to 90% of span point) (less than 5 sec) 5.7 sec	[1] N/A		
8. Zero gas 5% scale return time from span point (less than 5 sec) 5.9 sec	[1] N/A		

. Analyzer range(s) 0- 7.0% ,0- 15.0%

Comments:

The times shown reflect the response times through the entire sampling system. There is no practical method for isolating the individual analyzers to determine there reponse times.

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas
Prepared by: Butch Naegelin date: 12 11 80
Submitted by: Mark Dalen date: 12 11 80

w Exhaust NO Analyzer

	Yes/ Pass	NO/ Fail	Corrected
1. Make and model Same as NO_x Analyzer			
2. Flow rates O_2 ____ psi Internal Bypass ____ cfm External bypass (if used) ____ cfm			
3. Sample pressure/reactor vacuum ____ psi / ____ torr/mm			
4. Calibration gases cover all ranges?			
5. Analyzed span gas available? (80% FS)			
6. Use prepurified nitrogen or air for zero gas. (NO_x concentration less than 0.1 ppm) ____ ppm NO_x			
7. Check curve at ____ points across each range. Calibration shall be within ±2% of full scale or ±10% of measured value, whichever is smaller.			
8. Response time (zero gas to 90% of span point) (10 sec. max.)			
9. Zero gas 5% scale return time from span point. (10 sec max) ____ sec			
10. Analyzer range(s) 0- ____ ,0- ____ ,0- ____ ,0- ____			

omments:

ractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

epared by: Butch Neegelin date: 12 11 80

ubmitted by: Mark Dalen date: 12-11-80

Sealed Housing for Evaporative Determination

	Yes/ Pass	NO/ Fail	Corrected
1. Hydrocarbon analyzer			
a. Make and model N/A			
b. Use prepurified air for zero gas- Carbon less than 1 ppm, CO less than 1 ppm, CO_2 less than 400 ppm, NO_x less than .1 ppm Mfr. ____ ____ ppm C			
c. Prepurified air used for combustion? Mfr. ____			
d. Calibration gases cover all ranges?			
e. Analyzed span gas available for each range? (80% FS)			
f. Check curve at three (3) points across each range. Calibration shall be within ±1% of full scale or ±5% of measured value, whichever is smaller.			
g. Approved peaking procedure used?			
h. Fuel pressure (H_2 - He) ____ psi			
i. Fuel source pressure ____ psi			
j. Air pressure ____ psi			
k. Air source pressure ____ psi			
l. Sample pressure ____ psi			
m. Response time (zero gas to 90% span point) (less than 1.5 sec) ____ sec			
n. Zero gas 5% scale return time from span point (less than 3 sec) ____ sec			
o. Analyzer range(s) 0- ____ ,0- ____ ,0- ____			
p. Sample bypass flow rate ____ cfm			
2. Test Fuel			
a. Does fuel meet specifications?			
b. Was sample of fuel analyzed by other than manufacturer? (attach analysis)			
c. Refrigerated fuel handling system adequate?			

3. Enclosure Calibration

a. Background emissions (.4 gms/4 hrs. max.) ________ ____ ____ ______

b. Verify enclosure calibration (± 2% of injected value) ____ % ____ ____ ______

a. Enclosure volume (from calibration) ______ m3

c. Enclosure retention check (less than 4% leak rate in 4 hours) ____ % ____ ____ ______

4. Temperature Recorders

a. Capable of resolving time to 15 sec? ____ ____ ______

b. Capable of resolving temp. to ± .75°F (.42°C)? ____ ____ ______

c. Temp. accuracy of ± 2°F (1.1°C)? ____ ____ ______

d. Time accuracy over one (1) hour period (± 15 sec max.) ____ sec ____ ____ ______

e. Temp. sensor correctly located (3 ± .5 ft. from floor, approx. 4 inches from wall, approx. at vertical centerline of wall)? ____ ____ ______

5. Purge blower adequate? ____ ____ ______

6. Internal mixing blowers adequate? ____ ____ ______

7. Evaporative system pressure check equipment.

a. Able to measure fifteen (15) inches of H_2O pressure? ____ ____ ______

b. Capable of resolving pressure to ± 1.0 in. H_2O? ____ ____ ______

8. Enclosure cooling system.

a. Cooling surfaces monitored to maintain temp. between 68° F (20°C) and 86° F (30°C) ? ____ ____ ______

Comments:

N/A

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12 11 80

Submitted by: Mark Dalen date: 12 11 80

---

emperature Recording - Auxiliary Devices

		Yes/ Pass	No/ Fail	Corrected
1.	Device used to continuously measure wet and dry bulb temperatures during tests.			
	a. Make and model Thermocouples	X		
	b. Recorder make and model Easterline Anges MS 42-B Range 0- 50-100 °F	X		
2.	Soak area temperature continuously monitored and recorded on a strip chart?			
	Distance from Vehicles Max 15 ft			
	Range 0 to 100 °F			
	Chart Speed 0.5 in/hr			
	Chart Width 11 inches			
	90% Step Change in less than 10 sec? 4 sec.	X		

ents:

ntractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12 11 80

Submitted by Mark Dalen date: 12 11 80

Record Keeping System Check

		Yes/ Pass	NO/ Fail	Corrected
1.	Complete analytical system check made weekly?	X		
2.	Dynamometer calibration check made bi-weekly?	X		
3.	HC hang-up check using zero grade air results recorded daily? Sample bag and line 0.5 ppm/C(less than 1ppm C)	X		
4.	Are prepurified air and N_2 checks suitably recorded? A copy of manufacturers analysis is required for each cylinder.	X		
5.	HC, CO, CO_2 NO_x analytical system leak check performed and recorded daily?	X		
6.	CVS calibration check using propane injection on 0-300C range done daily before testing begins?	X		
	CVS sample and background bags purged, leak checked before each test and results recorded daily?	X		
8.	Check log of daily, weekly, biweekly, monthly calibrations and checks. Does each entry contain date, results and signatures?	X		
9.	Check maintenance log for all laboratory equipment?	X		
10.	Check for proper test fuel as required by Federal Register and/or contract.	X		
11.	Daily log of instrument settings.	X		
12.	Master log of all tests performed.	X		
13.	Proper storage for all instrument and driver's trace and temperature recorder charts?	X		
14.	Check master log of gas cylinders (including lab standards and span gases) to insure record of dates, cylinder numbers, pressures, types of gases, concentrations, and ranges of use?	X		

		Yes/ Pass	NO/ Fail	Corrected
15.	Check information on test data sheets			
a.	Test lab location, date and time of test.	X		
b.	Type of test (CVS, etc.)	X		
c.	Personnel involved.	X		
d.	Vehicle data - make, model, year, transmission type, odometer, engine family, carb. information, displacement, cylinders, type of emission controls, fuel tank capacity, inertia loading, actual road load HP @ 50 mph, indicated HP setting @ 50 mph, tire pressure, air conditioning.	X		
e.	Test conditions - Are barometric pressure and ambient temperature (dry bulb and wet bulb) in front of vehicle recorded continuously on strip charts during the tests) (dry bulb tolerance 68°F - 86°F)	X		
f.	Temperature and pressure of the exhaust and dilution air mixture entering the positive. displacement pump. Temperature of the mixture shall be recorded continuously during the test. Set point ___°F Max. Variation during test___°F	N/A		
16.	Do records include vehicle inspection parameters such as idle rpm, spark advance, idle mixture, exhaust HC, CO, etc?	X		
17.	Check for records of all pertinent information on recorder charts, such as: location, car and run no. date, time, person in charge; identify zero and span gas traces before and after test, gas analyzed and range(s) used?	X		

Comments:

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin. date: 12·11 80

[illegible] Mark Dalen date: 12·11·8

Documents to be included as part of this package	Yes/ Pass	No/ Fail	Corrected
1. Latest copy of all analyzer curves.	X		
2. Copy of certified calibration for the laminar flow element in the CVS calibration.	X		
3. Latest copy of the dynamometer curves.	X		
4. Copy of daily, weekly, monthly logs.	X		
5. Copy of preventive maintenance and calibration schedule for laboratory equipment other than dyno, CVS and analytical systems.	*		
6. Copy of fuel analysis.	X		
7. Copy of analysis of zero air and/or nitrogen cylinders.	N/A		
8. Copy of calibrations of flow meters.	X		
9. Copy of calibrations of temperature recorders.	X		

Comments:

* Preventive maintenance and calibrations are performed on a monthly basis or sooner if deemed necessary by the lab supervisor or lab technician.

Contractor: EG&G Automotive Research, Inc. site: San Antonio, Texas

Prepared by: Butch Naegelin date: 12·11·80

Submitted by: Mark Dalen date: 12·11·80

General Comments:

I have reviewed all the data contained in this report and have discussed its contents with the EPA inspector.

Signature Date

APPENDIX D

Calibration Forms

1) Daily Work Summary Log
2) Daily Equipment Check Sheet
3) Span Gas Information
4) Weekly Analyzer Calibration Curve Sheet
5) Monthly Analyzer Calibration Curve Sheet
6) Weekly CO_2/H_2O Interference Check
7) Zero Compensation Adjustment for CO_2 Interference
8) Daily NOx Converter Efficiency Test
9) Weekly Chassis Dyno Calibration Verification Data Sheet
10) Monthly Dynamometer Calibration Data Sheet
11) Daily CFV Propane Verification
12) CVS-CFV Flow Calculation Check
13) CVS-CFV Flow Computer Calibration Data Sheet
14) Monthly Temperature Recorder Calibration and Functional Check
15) Dynamometer/RLPC Calibration Check List
16) CVS-CFV Calibration Data Sheet

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Data Form No. 13

DAILY WORK SUMMARY LOG

Date:__________ Shift:_______

ENTER TIME OF COMPLETION AND INITIALS IN EACH ACTIVITY SPACE

PERFORM DAILY

Analytical Bench Start Up:____________________

Equipment Checks:____________________

NO_x Converter Efficiency:____________________

Propane Injection Verification:____________________

Span Gas/Pressure Log:____________________

Maintenance Performed:____________________

Dynamometer Warm Up: Dyno #1____________________

Dyno #2____________________

PERFORM WEEKLY

Chassis Dyno Verification: Dyno #1__________ Dyno #2__________

Analyzer Calibrations:____________________

PERFORMED PERIODICALLY

Chassis Dyno Calibration: Dyno #1__________ Dyno #2__________

CVS Flow Calibration:____________________

Test Number	Vehicle Number	Vehicle Make & Model	Received	Maintenance	Preconditioning	FTP	Data Reduction	Data Validation	FTP Sequence & Result (Good/Abort)
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			
					Dyno #	Dyno #			

Technician's Signature:____________________

Quality Control Signature:____________________

VW Observer:____________________

SUBSCRIBED AND SWORN TO BEFORE ME
THIS ______ DAY OF ______, 197

____
NOTARY PUBLIC

MY COMMISSION EXPIRES:________

DAILY EQUIPMENT CHECK SHEET
CONSOLE NUMBER 1

Date [illegible]
Page 1 of 3

Date	CO Functional Check 0-100 PPM (R1-1)					CO$_2$ Functional Check 0-1.5% (R1-1)					HC Functional Check 0-100 PPM (R-1-1)					NO$_x$ Functional Check 0-100 PPM (R1-)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	CO Functional Check 0-500 PPM (R1-2)					CO$_2$ Functional Check 0-4% (R1-2)					HC Functional Check 0-500 PPM (R1-2)					NO$_x$ Functional Check 0-300 PPM (R1-2)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	Filter Checks				System Leak Checks							NO$_x$ Conv. Eff.	Propane Verification % Error	HC Hang-up In Deflection Units				Ambient Data	
	CFV	F1	F2	F3	Anal. System	B1	B2	B3	B4	B5	B6			Sample Line	Bag 4	Bag 5	Bag 6	CO	HC

DAILY EQUIPMENT CHECK SHEET
CONSOLE NUMBER 1

Date
Page 2 of 3

Date	CO Functional Check 0-1000 PPM (R1-3)					CO Functional Check 0-2.0% (R1-5)					CO$_2$ Functional Check 0-7.0% (R1-3)					HC Functional Check 0-1000 PPM (R1-3)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	CO Functional Check 0-5000 PPM (R1-4)					CO Functional Check 0-10% (R1-6)					CO$_2$ Functional Check 0-15% (R1-4)					HC Functional Check 0-5000 PPM (R1-4)				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

Date	NO$_x$ Functional Check 0-30 PPM (R1-0)					NO$_x$ Functional Check 0-1000 PPM (R1-3)					HC Functional Check 0-500 PPM HEX 500					HC FUNCTIONAL CHECK 0-2000 PPM HEX 2000				
	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise	Gain	Zero	Span Drift	Zero Drift	% Noise

DATA FORM NO. ______

Page ______ of ______

SPAN GAS INFORMATION

Component	Range Code	Full Conc.	Span Gas Concentration	Span Point Deflections	Effective Date	Effective Run Numbers
CO	11	100 ppm				
	12	500 ppm				
	13	1,000 ppm				
	14	5,000 ppm				
	15	2.0%				
	16	10.0%				
CO_2	11	1.5%				
	12	4.0%				
	13	7.0%				
	14	15.0%				
O_2	13	25.0%				
	11	100 ppm				
HC	12	500 ppm				
TOTAL	13	1,000 ppm				
CARBON	14	5,000 ppm				
HEXANE	N/A	500 ppm				
HEXANE	N/A	2,000 ppm				
NO_x	10	30 ppm				
	11	100 ppm				
	12	300 ppm				
	13	1,000 ppm				

Date: ________ Technician: ____________ Quality Audit: ________
Date: ________ Technician: ____________ Quality Audit: ________
Date: ________ Technician: ____________ Quality Audit: ________
Date: ________ Technician: ____________ Quality Audit: ________
Date: ________ Technician: ____________ Quality Audit: ________
Date: ________ Technician: ____________ Quality Audit: ________
Date: ________ Technician: ____________ Quality Audit: ________

DATA FORM NO. ______

Supplemental Page

SPAN GAS INFORMATION

Component	Range Code	Full Conc.	Span Gas Concentration	Span Point Deflections	Effective Date	Effective Run Numbers
CO	11	100 ppm				
	12	500 ppm				
	13	1,000 ppm				
	14	5,000 ppm				
	15	2.0%				
	16	10.0%				
CO_2	11	1.5%				
	12	4.0%				
	13	7.0%				
	14	15.0%				
O_2	13	25.0%				
	11	100 ppm				
HC	12	500 ppm				
TOTAL	13	1,000 ppm				
CARBON	14	5,000 ppm				
HEXANE	N/A	500 ppm				
HEXANE	N/A	2,000 ppm				
NO_x	10	30 ppm				
	11	100 ppm				
	12	300 ppm				
	13	1,000 ppm				

Prepared By: ______________________ Date ________

Quality Audit: ______________________ Date ________

WEEKLY ANALYZER CALIBRATION CURVE SHEET

Gas Analyzed:__________ Range:__________

Analyzer Make/Model:__________ Cell Length:__________

Serial Number:__________ Recorder:__________

Zero Setting:__________ Gain:__________ Time at Start:__________ am/pm

Nominal Meter (%)	Nominal Concentrat (PPM)	Cylinder Serial Number	Cylinder Pressure (To Reg)	Cylinder Pressure (Out Reg)	Analyzer Outlet Flow (SCFH)	Cylinder Concentrat. (PPM)	Meter Deflect.	Lower Limit on Deflect.	Upper Limit on Deflect.
0	0								
90									
75									
60									
45									
30									
15									
Span 90									

Operator's Signature:__________ Completion Time:__________ am/pm Date:__________

Quality Control Signature:__________

VW Observer:__________

Data Form [illegible]

MONTHLY ANALYZER CALIBRATION CURVE SHEET

Gas Analyzed:__________ Range:__________

Analyzer Make/Model:__________ Cell Length:__________

Serial Number:__________ Recorder:__________

Zero Setting:__________ Gain:__________ Time At Start:__________ am/

Nominal Meter (%)	Nominal Concentrat. (PPM)	Cylinder Serial Number	Cylinder Pressure (To Reg)	Cylinder Pressure (Out Reg)	Analyzer Outlet Flow (SCFH)	Cylinder Concentrat. (PPM)	Meter Deflectio
0	0						
90							
75							
60							
45							
30							
15							
Span 90							

Operator's Signature:__________ Completion Time:__________ am/pm Date:__________

Quality Control Signature:__________

Observer:__________

DATA FORM 18 PAGE 1 OF 2

WEEKLY CO_2/H2O INTERFERENCE CHECK

DATE: ____________ TIME: ____________

ANALYZER MODEL: ________ SERIAL NO: 466920/24

1. ZERO LCO ANALYZER RANGE 1 (LCO_2 ANALYZER MUST BE ON RANGE 2)

2. SET RECORDER PEN ON THE 10.0 LINE OF CHART PAPER AND USE THIS AS ZERO SET POINT.

3. INTRODUCE INTERFERENCE GAS. BUTTON SELECTION:
   LCO = Master
   LCO_2 = SPAN
   MASTER = Idle
   INTF CHK = in

4. __________ WET CO_2 DEFLECTION (Bubbles should be seen in Bubbler)

5. ZERO LCO ANALYZER. WET CO_2 DEFLECTION MUST BE LESS THAN 3.0 PPM.
   BUTTON SELECTION FOR ZERO:
   LCO = Zero
   LCO_2 = Zero
   MASTER = Idle
   INTF CHK = out

OPERATORS SIGNATURE ______________________

QUALITY CONTROL SIGNATURE ____________________

DATA FORM 18 PAGE 2 OF 2

ZERO COMPENSATION ADJUSTMENT FOR CO_2 INTERFERENCE

NOTE: IF ANY ADJUSTMENT ARE REQUIRED, ALL STEPS MUST BE DONE

AFTER COMPLETION OF ADJUSTMENTS A MONTHLY ANALYZER CALIBRATION MUST BE DONE ON ALL RANGES.

1. LCO ANALYZER TO RANGE 1

2. LCO_2 ANALYZER TO RANGE 2

3. DVM SELECTOR TO LCO

4. CONNECT A VOLTMETER BETWEEN TP2 AND E (COM) ON MOTHERBOARD 2E

5. ZERO AND SPAN LCO ANALYZER AND RETURN TO ZERO. (DO NOT TOUCH SPAN KNOB AGAIN AFTER ANALYZER IS SPANNED)

6. INTRODUCE INTERFERENCE GAS. BUTTON SELECTION:
   LCO = MASTER
   LCO_2 = SPAN
   MASTER = IDLE
   INTF CHK = in

7. ON MOTHERBOARD 2E, ADJUST THE CS 1 POTENTIOMETER FOR A 0.000 ± 1mv INDICATION ON THE VOLTMETER

8. INTRODUCE ZERO GAS AND CHECK ANALYZER FOR ZERO READING. BUTTON SELECTION:
   LCO = ZERO
   LCO_2 = ZERO
   MASTER = IDLE
   INTF CHK = out

9. REPEAT STEPS #6 - 8. IF NO ADJUSTMENTS ARE REQUIRED CONTINUE TO STEP # 10

10. LCO ANALYZER TO RANGE 3. CHECK ZERO. IF ZERO IS NOT CORRECT, ADJUST MZ 3 POTENTIOMETER ON MOTHERBOARD 2E UNTIL VOLTMETER INDICATES 0.000 ± 1mv.

11. INTRODUCE INTERFERENCE GAS. (BUTTON SELECTION IS SAME AS STEP #6)

12. ADJUST THE CG 3 POTENTIOMETER ON MOTHERBOARD 2E FOR A 0.000 ± 1mv INDICATION ON THE VOLTMETER.

13. INTRODUCE ZERO GAS AND CHECK ANALYZER FOR ZERO READING. (BUTTON SELECTION IS THE SAME AS STEP #8)

14. REPEAT STEPS #10 - 13. IF NO FURTHER ADJUSTMENTS ARE REQUIRED, THIS COMPLETES INTERFERENCE ZERO COMPENSATION ADJUSTMENTS. THE ANALYZER REQUIRES A MONTHLY CALIBRATION ON ALL RANGES.

DATE________ ANALYZER MODEL AIA 23 SERIAL NO 466920/24

WERE THE FOLLOWING POTENTIOMETERS ADJUSTED?

MZ 1 YES NO
CS 1 YES NO

MZ 3 YES NO
CG 3 YES NO

OPERATORS SIGNATURE______________

Data Form 19

Page 1 of 2

DAILY NO_X CONVERTER EFFICIENCY TEST
(HORIBA NO_X GENERATOR MODEL #210)

DATE OF TEST: ____________ TIME: ____________

OPERATOR ____________ ANALYZER MAKE AND MODEL ____________

(NO) CYLINDER # ________ CONCENTRATION ______ PPM VENDOR ____________

AIR CYLINDER # ________ VENDOR ________ POT SET ________

BAROMETRIC PRESSURE ________ " HG BAROMETER TEMPERATURE ________ °F

1. PRESS NO_X GEN. BUTTON ON CONTROL PANEL IN.
2. VERIFY THAT OZONE GENERATOR IS ON
3. FLOW CONTROL VALVES ON DRY AIR, OZONE BYPASS, AND NITRIC OXIDE ARE OFF
4. POWER SWITCH "OFF" AND OZONE AND AIR SHUT OFF VALVE "CLOSED"
5. ADJUST NITRIC OXIDE FLOW CONTROL VALVE FOR 6 TO 10 SCFH
6. NO_X ANALYZER TO "NO" MODE, AND SPAN TO 80.0. RECORD THIS ON CHART. ________
7. POWER SWITCH TO "ON".
8. OPEN OZONE & AIR SHUTOFF VALVE AND ADJUST OZONE BYPASS FLOW CONTROL VALVE TO 1 SCFH
9. ADJUST OZONE FLOW NEEDLE VALVE UNTIL THE NO_X ANALYZER INDICATES APPROX. 16.0 RECORD READING ________
10. POWER SWITCH TO "OFF". NOTE: DVM MUST RETURN TO 75.0 OR HIGHER. IF IT DOES NOT, REPEAT STEPS 6-9 WITH OZONE BYPASS FLOW SET AT A LOWER RATE. (LESS THAN 1.0 SCFH)
11. ADJUST FLOW CONTROL ON DRY AIR FLOWMETER FOR A READING OF 72.0 ± 1.0 RECORD READING ________
12. POWER SWITCH TO "ON".
13. READJUST OZONE FLOW NEEDLE VALVE FOR A READING OF 14.4 ± 1.0 RECORD READING ________
14. POWER SWITCH TO "OFF".
15. VERIFY THAT THE READING IS STILL APPROX. 72.0 RECORD READING ________
16. POWER SWITCH TO "ON" & RECORD READING ________
17. NO_X ANALYZER TO "NO_X" MODE ALLOW TO STABILIZE AND RECORD READING ________
18. POWER SWITCH TO "OFF" AND ALLOW TO STABILIZE AND RECORD READING ________
19. CLOSE OZONE AND AIR SHUTOFF VALVE AND RECORD STABLE READING ________
    NOTE THIS READING WILL NOT BE MORE THAN 4.0 OF STEP #6

Page 2 of 2

DAILY NOX CONVERTER EFFICIENCY TEST
(HORIBA NO_X GENERATOR MODEL #210)

20. NO_X ANALYZER TO ZERO.
21. PRESS NO_X GEN. BUTTON ON CONTROL PANEL TO RELEASE BUTTON TO THE OUT " OFF" POSITION.
22. PERFORM THE FOLLOWING CALCULATION FOR PERCENT CONVERSION:

    (1+(a-b)/(c-d))* 100 NOTE: This is how it is entered in the H/P Calculator.

    a = step # 17
    b = step # 18
    c = step # 15
    d = step # 16

    Percent efficiency = ________ (must be over 90%)

    OPERATOR'S SIGNATURE ____________

    QUALITY CONTROL SIGNATURE ____________

Data Form No. 20.1
(Revised A. 11-25-80)

Page 1 of 1

WEEKLY CHASSIS DYNO CALIBRATION
VERIFICATION DATA SHEET

DATE: ____________________ DYNO I.D. No. ______________

TIME: ________________AM - PM TECHNICIAN: ______________

DATE OF LAST ELECTRONIC CALIBRATION: ____________________

DATE OF LAST MECHANICAL CALIBRATION: ____________________

Inertia Wt. (lbs)	T.W.	F.R. I.H.P.	R.R. I.H.P.	Time (Seconds) Run 1	Run 2	Run 3	Average	Calculated Time	Diff. (sec)

	Front Roll	Rear Roll	Must Be	F.R. \ Diff. / R.R.	
Speed at 1800 R.P.M.			46.3 ± .2		

This coastdown is to be used for Car(s) # ________ >		
Actual Horsepower =	K Factor =	

Technician's Signature: ____________________

Quality Control Signature: ____________________

Data Form No. 20

MONTHLY
DYNAMOMETER CALIBRATION DATA SHEET

Date: ____________________ Dyno I.D.: ____________________

Time: ________________ am/pm Technician: ____________________

Comments from Electrical Adjustments: ____________________

Inertia Weight (LBS)	Indicated H.P.	Time (Seconds) Run 1	Run 2	Run 3	Average	K	Actual RHP

$$\text{Actual RHP} = \frac{K}{\text{Average Time}}$$

Technician's Signature: ____________________ Time: _____ am/pm Date: _________

Quality Control Signature: ____________________

Data Form 21

DAILY C. F. V. PROPANE VERIFICATION

OPERATOR:__________________ DATE:__________________

BAROMETER TEMP.____________ °F BAROMETRIC PRESSURE________ " HG

BOTTLE WEIGHT BEFORE______________

BOTTLE WEIGHT AFTER______________

Vmix (SCF) ______________

EXHAUST BAG #__________
HC RANGE _____ METER DEFLECTIONS______________ CONC.__________PPM

BACKGROUND BAG #__________
HC RANGE _____ METER DEFLECTIONS ______________ CONC.__________PPM

OPERATOR'S SIGNATURE ____________________ TIME:________________

QUALITY CONTROL SIGNATURE ________________________

DATA FORM NO. 30
(Rev. 1-10 /8)
Page 1 of 1

CVS-CFV FLOW CALCULATION CHECK

DATE______________________ TIME __________ AM / PM TECHNICIAN

CVS MASS CALCULATION TAPE, PROGRAM #5

	T_A (°F) AMBIENT TEMP	B(IN. HG) BARO PRESS	B_T (°C) BARO TEMP	TIME SECONDS	Δ P (IN. H_2O)	INDICATED VOLUME	CALCULATED VOLUME	DIFFEREN
TEST 1								
TEST 2								
TEST 3								
AVERAGE								

TECHNICIAN'S SIGNATURE ____________________ TIME ______________ AM / PM

DATE ______________________

Q. C. ENGINEER'S
SIGNATURE ______________________________ TIME ______________ AM / PM

DATE ______________________

CVS-CFV FLOW COMPUTER CALIBRATION DATA SHEET Sheet 1 of 3

CVS NUMBER________

DATE________________ TIME________ AM/PM TECHNICIAN ________________

NOTE: USE CVS MASS CALCULATION TAPE, PROGRAM #5

Counter For Phase	Pot Turns Before This Phase	Obs. Baro. Pressure (In. Hg)	Baro Temp (^oC)	Ambient Temp (^oF)	Elapsed Time (Seconds)	ΔP Venturi Inlet Dep (In. H_2O)	Counter Ind. Vol. (Ft.^{3})	Calc. Vol. (Ft.^{3})	Counter Error (Ft.^{3})
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
Average									

Data Form No. 25
Supplement
Sheet 2 of 3

CVS NUMBER________

Counter For Phase	Pot Turns Before This Phase	Obs Baro. Pressure (In. Hg)	Baro Temp (^oC)	Ambient Temp (^oF)	Elapsed Time (Seconds)	ΔP Venturi Inlet Dep (In. H_2O)	Counter Ind. Vol. (Ft.^{3})	Calc. Vol. (Ft.^{3})	Counter Error (Ft.^{3})
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
		Avg.	Avg.	Avg.					
Average									

[illegible]

Sheet 3 of 3

Applicable Specifications:

Elapsed Time (Seconds)	Maximum Allowed Error For Single Counter (Ft.^{3})	Maximum Allowed Average Error For The Three Counters (Ft.^{3})	Maximum Allowed Difference Between Any Two of the Three Counter Errors (Ft.^{3})
500	10.00	6.00	8.00
1000	15.00	9.00	10.00

TECHNICIAN'S SIGNATURE ______________ DATE ______________

TIME ______________ AM / PM

THIS DATA HAS BEEN REVIEWED AND APPROVED
BY EG&G AND QUALITY CONTROL DEPARTMENT:

______________ DATE ______________

Data Form No. 27

MONTHLY

TEMPERATURE RECORDER

CALIBRATION AND FUNCTIONAL CHECK

ITEMS REQUIRED: Thermocouples

Three beakers, each of which has a capacity of at least 500 milliliters

Ice (needed only if 50° water cannot be obtained from tap)

Precision thermometer having NBS traceability

Instrument repair tool kit

Implement for stirring water baths

CALIBRATION AND FUNCTIONAL CHECK:

1. Use the pertinent sections of the instrument manual to make any mechanical adjustments which are deemed necessary after observing the recorder in operation.
2. Allow the recorder and its servo-mechanism to warm up for at least 10 minutes.
3. Using the beakers, tap water and the precision thermometer, make three water baths having different temperatures, as follows:

Cool Water Bath - 50° to 60°F

Room Temperature Water Bath - 70° to 80°F

Warm Water Bath - 85° to 88°F

When this is complete, check each thermocouple and its associated recorder channel against the precision thermometer in each water bath in the following sequence:

Room Temperature Water Bath
Cool Water Bath

Room Temperature Water Bath
Warm Water Bath

Room Temperature Water Bath

When performing these checks, the water bath in use should be stirred constantly and readings should be taken only after both the thermometer and the recorder readings have been stabilized. When changing water, baths, visually observe the transient response of the recorder to see whether or not overshoot occurs and to see whether or not the overshoot is less than two percent (2%) of full scale.

Usually, no overshoot will occur and a rough estimate of the instrument deadband can be obtained from the difference between the first and second and the second and third readings of the room temperature water bath. Deadband, as indicated by the above mentioned differences, should not exceed ±0.2% of full scale. If the indicated deadband does exceed ±0.2% of full scale, the readings discussed above should be taken again to ensure that the high indicated deadband was not a result of temperature changes in the room temperature water bath.

The temperature readings on the recorder should agree with the corrected thermometer readings within ±1°F. If only one of the thermocouples shows a response which is out

Data Form No. 27

WATER BATH	THERMOMETER INDICATED TEMPERATURE						RECORDER INDICATED TEMPERATURE						CORRECTED THERMOMETER READING					
	THERMOCOUPLE CHANNEL						THERMOCOUPLE CHANNEL						THERMOCOUPLE CHANNEL					
Room Temperature																		
Cool																		
Room Temperature																		
Warm																		
Room Temperature																		

	THERMOCOUPLE CHANNEL						THERMOCOUPLE CHANNEL					
Overshoot (% of Full Scale)												
Deadband (±% of Full Scale)												

Technician: ______________________

VW Observer: ______________________

Data Form No. 27

Temperature Recorder
Calibration and Functional Check
Page 2

of the ±1°F tolerance, that thermocouple may be faulty and it should be replaced and the new one should be checked. If two or more of the thermocouples show a response outside the ±1°F tolerance, the recorder gain and zero potentiometers may need adjustment. Before adjusting the gain or zero potentiometers, each thermocouple should be rechecked against the thermometer in each water bath to ensure that an out-of-tolerance condition indeed exists.

RESULTS OF CALIBRATION AND FUNCTIONAL CHECK:

1. Mechanical Adjustments Performed: ______________________

2. Electrical Adjustments Performed: ______________________

APPLICATION SPECIFICATIONS FROM CFR: Accuracy to within ±1.8°F

OTHER SPECIFICATIONS: Overshoot ≤2% of full scale
Deadband ≤0.2% of full scale

CALIBRATION AND FUNCTIONAL CHECK PERFORMED BY: ______________________

DATE: ____________ TIME: ________ am/pm

VW Observer: ______________________

SUBSCRIBED TO AND SWORN TO BEFORE ME
THIS ______ DAY OF ______, 197

____
NOTARY PUBLIC

MY COMMISSION EXPIRES: __________

DATE FORM NO. 301.2
Page 1 of 7

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

* (Dyno #1 ONLY, Serial #A-32206-3-578)

DYNAMOMETER NUMBER: ____________________ SERIAL NUMBER: ____________________

TECHNICIAN: ____________________ DATE: ____________________

A. WARM UP:

________ 1. Unless the dynamometer has been used within the last half hour, obtain a copy of DATA FORM 107.1 and perform a dynamometer warm up, as per the procedure on that form.

Warm up performed: ____________________

Warm up not necessary since dynamometer last ust at: ____________________ A.M./P.M.

________ 2. Negative lead of DVM connected to ITB COMMON terminal 211: __________

B. REAR ROLL CALIBRATION: (Reference Figure 2)

________ 1. Speed/power switch to: REAR ROLL __________

________ 2. Positive lead of DVM to test point 2 board 8. __________

________ 3. Adjust pot 3 board 8 to DVM reading of 0.000± .002 VDC (ROLLS STOPPED). __________

________ 4. Adjust pot 4 board 8 to DVM reading of 4.63± .002 VDC (REAR ROLL at 1800 rpm) Time: __________ AM/PM __________

________ 5. Recheck pot 3 board 8 reading at 0.000± .002 VDC (ROLLS STOPPED).

C. FRONT ROLL CALIBRATION: (Reference Figure 2)

________ 1. Speed/power switch to: FRONT ROLL __________

________ 2. Positive lead of DVM to test point 5 board 7. __________

________ 3. Adjust pot 6 board 7 to DVM reading of 0.000± .002 VDC (ROLLS STOPPED). __________

________ 4. Adjust pot 7 board 7 to DVM reading of 4.63± .002 VDC (FRONT ROLL at 1800 rpm). __________

________ 5. Recheck pot 6 board 7 reading at 0.000± .002 VDC (ROLLS STOPPED). __________

DATA FORM NO. 301.2
Page 2 of 7

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

D. DIGITAL SPEED READ-OUT CALIBRATION:

________ 1. Positive lead of DVM to test point 2 board 8. __________

________ 2. Switch 2 board 8 to: CAL (Away from board). __________

________ 3. Adjust pot 5 board 8 to DVM reading of 5.000 ± .002 VDC. __________

________ 4. Adjust span pot under logo on instrument box to: 50.0 mph ON DIGITAL SPEEDMETER. __________

E. TORQUE CELL CALIBRATION:

________ 1. Remove vehicle - RELEASE DYNO BRAKES. __________

________ 2. Switches 1 and 2 board 8 and switch 1 board 7 to: RUN (TOWARD BOARD). __________

________ 3. Positive lead of DVM to test point 4 board 8 reading (INCLUDING + or - SIGN). __________

________ 4. Switch 2 board 8 to: CAL (AWAY FROM BOARD). __________

________ 5. Adjust pot 5 board 8 to: 50 mph READING ON DIGITAL SPEEDMETER. __________

________ 6. Positive lead of DVM to test point 1 board 8. __________

________ 7. Remove load cell hysteresis (LIGHTLY TAP LOAD CELL MOUNTING CHANNEL WITH MALLET). __________

________ 8. Adjust pot 1 board 8 to DVM reading of 0.05± 0.005 VDC. __________

________ 9. Positive lead of DVM to test point 4 board 8. __________

________ 10. Adjust pot 1 board 8 clockwise until DVM reading JUST equals reading at 3__________ (TURN POT SLOWLY SO AS NOT TO OVERSHOOT READING). __________

________ 11. Positive lead of DVM to test point 1 board 8 (RECORD READING). __________

________ 12. Install arbor D33102 and TIGHTEN - retaining screw to snug. __________

________ 13. Gently install three D33112 Weights - REMOVE HYSTERESIS. __________

DATA FORM NO. 301.2
Page 3 of 7

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

E. TORQUE CELL CALIBRATION: (continued)

_____ 14. Adjust pot 2 board 8 to DVM reading of 4.07± .002 VDC. _____

_____ 15. Remove weight and arbor - REMOVE HYSTERESIS. _____

_____ 16. Compare DVM reading with reading in 11 within ± 0.002 VDC if not within tolerance, adjust pot 1 board 8 to proper setting - - THEN REPEAT STEPS 12 through 16. _____

F. DIGITAL POWER READOUT CALIBRATION:

_____ 1. Adjust power meter reading to: 00.0 HP (ADJUST SCREW LOCATED AT LOWER RIGHT HAND CORNER OF METER DVM). _____

_____ 2. Switches 1 and 2 board 8 to: CAL (AWAY FROM BOARD). _____

_____ 3. Adjust pot 5 board 8 to: 50.0 mph (ON DITITAL SPEEDMETER) _____

_____ 4. Positive lead of DVM to test point 1 board 8. _____

_____ 5. Adjust pot 6 board 8 to DVM reading of 4.070 ± .002 VDC. _____

_____ 6. Adjust power span pot for reading of 40.7 (LOCATED UNDER CLAYTON LOGO). _____

G. HORSEPOWER SCALING VERIFICATION:

_____ 1. Switch 1 board 8 to: RUN (TOWARD BOARD) _____

_____ 2. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 3. Install arbor and weights and verify reading (REMOVE HYSTERESIS AFTER EACH WEIGHT). _____

_____ None 00.0 ± 0.1 Arbor + 35# 14.8 + 0.1 _____

_____ Arbor 1.9 ± 0.1 Arbor + 110# 40.7 ± 0.1 _____

_____ Arbor + 70# 27.8 ± 0.1

_____ 4. If not within tolerance, STEPS "E" AND "F" REPEATED TO CORRECT. _____

DATA FORM NO. 301.2
Page 4 of 7

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

H. HORSEPOWER "CAL CHECK" CALIBRATION:

_____ 1. Warm up dynamometer for minimum 15 minutes. _____

_____ 2. Set mode selector switch to: PENDENT _____

_____ 3. Switch 1 board 8 to: RUN (TOWARD BOARD). _____

_____ 4. Switch 1 board 7 to: RUN (TOWARD BOARD). _____

_____ 5. Switch 2 board 8 to: CAL (AWAY FROM BOARD). _____

_____ 6. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 7. Remove vehicle - RELEASE DYNO BRAKES. _____

_____ 8. Remove load cell HYSTERESIS. _____

_____ 9. Press CAL check button and record HP reading_____ HP on digital HP meter. _____

I. DEADBAND ADJUSTMENT:

_____ 1. Turn water supply to dynamometer OFF. _____

_____ 2. Press pendant load or unload button to RELEASE pressure in the lines. _____

_____ 3. Speed/power switch to: FRONT ROLL _____

_____ 4. Set thumbwheel to: 30.0 mph _____

_____ 5. Set mode selector to: THUMBWHEEL _____

_____ 6. Set vehicle factor to: 0.00 _____

_____ 7. Switches 1 and 2 board 8 and switch 1 board 7 to: CAL (AWAY FROM BOARD). _____

_____ 8. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 9. Adjust pot 6 board 8 to: 30.0 mph (ON DIGITAL SPEEDMETER) _____

_____ 10. Adjust pot 6 board 8 to START LOW RATE UNLOAD LIGHT PULSE - RECORD HP READING_____ HP. _____

DATA FORM NO. 301.2

Page 5 of 7

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

I. DEADBAND ADJUSTMENT: (continued)

11. Adjust pot 6 board 8 to START LOW RATE UNLOAD LIGHT PULSE - RECORD HP READING ____________ HP.

12. Difference between 11 and 12 ____________ HP (THIS IS THE DEADBAND).

13. Adjust pot 3 board 2 and REPEAT 8 and 9 UNTIL DEADBAND IS 0.4 HP.

J. THUMBWHEEL "LOW RANGE" ADJUSTMENT:

1. Set thumbwheel to: 3.0 HP

2. Set mode selector to: THUMBWHEEL

3. Set vehicle factor switch to: 0.00

4. Switches 1 and 2 board 8 and switch 1 board 7 to: CAL (AWAY FROM BOARD).

5. Adjust pot 5 board 8 to: 50.0 mph (ON DIGITAL SPEEDMETER)

6. Adjust pot 6 board 8 to: 3.0 HP (ON DIGITAL POWER METER)

7. Adjust pot 1 board 7 until LOW AND HIGH RATE LOAD AND UNLOAD LIGHTS GO OUT.

8. Adjust pot 6 board 8 counter - CLOCKWISE TO START LOW RATE UNLOAD LIGHT PULSE - RECORD HP READING: __________ HP.

9. Adjust pot 6 board 8 CLOCKWISE TO START LOW RATE LOAD LIGHT PULSE - RECORD HP READING: __________ HP.

10. Adjust pot 1 board 7 for LOAD LIGHT PULSE AND UNLOAD LIGHT PULSE - TO BE CENTERED AROUND 3.0.

K. THUMBWHEEL "SPAN" ADJUSTMENT:

1. Set thumbwheel to: 39.0 HP

2. Set mode selector to: THUMBWHEEL

3. Set vehicle factor to: 0.00

4. Switches 1 and 2 board 8 and 1 board 7 to: CAL (AWAY FROM BOARD).

5. Adjust pot 5 board 8 to: 50.0 ON DIGITAL SPEEDMETER.

DATA FORM NO. 301.

Page 6 of 7

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

K. THUMBWHEEL "SPAN" ADJUSTMENT: (continued)

6. Adjust pot 6 board 8 to: 39.0 HP ON DIGITAL POWER METER.

7. Adjust pot 1 board 1 until LOW AND HIGH RATE LOAD/UNLOAD LIGHTS GO OUT.

8. Adjust pot 6 board 8 counter-CLOCKWISE TO START LOW RATE UNLOAD LIGHT PULSE. RECORD HP READING: ____________ HP

9. Adjust pot 6 board 8 CLOCKWISE TO START LOW RATE LOAD LIGHT PULSE. RECORD HP READING: ____________ HP

10. Adjust pot 1 board 1 for LOAD LIGHT PULSE AND UNLOAD LIGHT PULSE. TO BE CENTERED AROUND 39.0 HP. (DIFFERENCE BETWEEN 8 and 9).

L. HIGH RATE DEADBAND ADJUSTMENT:

1. Set thumbwheel to: 39.0 HP.

2. Set mode selector to: THUMBWHEEL

3. Set vehicle factor to: 0.00

4. Switches 1 and 2 board 8 and switch 1 board 7 to: CAL (AWAY FROM BOARD).

5. Adjust pot 5 board 8 to: 50.0 mph ON DIGITAL SPEEDMETER.

6. Adjust pot 6 board 8 to: 40.5 mph ON DIGITAL POWER METER.

7. Adjust pot 1 board 3 to START HIGH RATE UNLOAD LIGHT

8. Adjust pot 6 board 8 to: 37.5 HP ON DIGITAL POWER METER.

9. Adjust pot 1 board 2 to START HIGH RATE LOAD LIGHT.

M. DRIVER CUT-OFF ADJUSTMENT:

1. Set thumbwheel to: 00.0 HP

2. Switches 1 and 2 board 8 and switch 1 board 7 to: RUN (TOWARD THE BOARD)

3. Positive lead of DVM to TEST POINT 1 board 8.

4. Adjust pot 1 board 8 to DVM READING OF +0.060 ± .005 VDC.

CVS CFV CALIBRATION DATA SHEET

DATE ______________________

CVS MAKE/MODEL ______________________

TIME @ START ______________________

SERIAL NO. ______________________

LFE SERIAL NO. ______________________

TECHNICIAN ______________________

	LFE INLET TEMP (°F) T_1	LFE INLET VACUUM (In. H_2O) P_m	CFV INLET VACUUM (In. H_2O) P_{ci}	LFE PRESSURE DROP (In. H_2O) ΔP_m	CVS BLOWER INLET VAC. (In. H_2O) P_B	AMB. BARO. PRESSURE (In. Hg) P_A	P_B	ΔP_m	P_{ci}	P_{mi}	T_1	OK? (YES/) (RECHECK)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												

TEST TECHNICIAN SIGNATURE ______________________ TIME ________ AM/PM DATE ______________

DATA FORM NO. 301.2

Page 7 of 7

DYNAMOMETER/RLPC CALIBRATION CHECK LIST

M. DRIVER CUT-OUT ADJUSTMENT: (continued)

________ 5. Adjust pot 2 board 3 CLOCKWISE UNTIL BOTH LOW AND HIGH RATE UNLOAD LIGHT GO OUT. ____________

________ 6. REMOVE HYSTERESIS. ____________

________ 7. Adjust pot 1 board 8 to SAME READING AS RECORDED IN E-11 - READING (INCLUDE + OR - SIGN). ____________

N. FINAL SYSTEM PREPARATION:

________ 1. Switches 1 and 2 board 8 and switch 1 board 7 to: RUN (TOWARD THE BOARD). ____________

________ 2. Remove DVM leads. ____________

________ 3. Reinstall COVER ON CONTROL BOX. ____________

________ 4. Return LOGO ON INSTRUMENT BOX TO HORIZONTAL. ____________

________ 5. Turn WATER SUPPLY ON. (RECORD WATER PRESSURE). ____________

SIGNATURE OF TECHNICIAN: ______________________

DATE: ______________ TIME: ________ AM ________ PM

THESE DATA SHEETS HAVE BEEN REVIEWED AND APPROVED BY EG&G-AR QUALITY CONTROL DEPARTMENT.

______________________ DATE: ______________

EG&G AUTOMOTIVE RESEARCH, Inc.

APPENDIX E

Audit Forms

1) Comments to be resolved
2) Quality Control Audit of: Non-Evaporative Hot LA-4 Precondition Check List
3) Quality Control Audit of: Precondition Trace
4) Quality Control Audit of: Dynamometer Warm-up Check List
5) Quality Control Audit of: Driver's FTP Check List
6) Quality Control Audit of: WB/DB Chart (EPA sequence)
7) Quality Control Audit of: FTP Driver's Trace
8) Quality Control Audit of: CO/CO_2 Instrument Traces
9) Quality Control Audit of: CO/CO_2 Instrument Traces (Bagged Idle Test)
10) Quality Control Audit of: HC/NOx Instrument Traces
11) Quality Control Audit of: NO Instrument Traces (50 Cruise Test)
12) Quality Control Audit of: HC/NOx Instrument Traces (Bagged Idle Test)
13) Quality Control Audit of: HC/NOx Instrument Traces (Highway Fuel Economy)
14) Quality Control Audit of: CO/CO_2 Instrument Traces (Highway Fuel Economy)
15) Quality Control Audit of: NO Instrument Trace - Loaded Two Mode
16) Quality Control Audit of: NO Instrument Trace (4 Speed Idle Test)
17) Quality Control Audit of: CO/CO_2 Instrument Traces (4 Speed Idle Test)
18) Quality Control Audit of: CO/CO_2 Instrument Traces (50 Cruise Test)
19) Quality Control Audit of: Hexane Instrument Trace (50 Cruise Test)
20) Quality Control Audit of: Hexane Instrument Trace (4 Speed Idle Test)
21) Quality Control Audit of: CO/CO_2 Instrument Traces - Loaded Two Mode
22) Quality Control Audit of: Hexane Instrument Trace - Loaded Two Mode
23) Quality Control Audit of: CVS-CFV Test Data Sheet

APPENDIX E

Audit Forms
(continued)

24) Quality Control Audit of: Bagged Idle Test
25) Quality Control Audit of: 50 Cruise Test Data Sheet
26) Quality Control Audit of: Highway Fuel Economy Data Sheet
27) Quality Control Audit of: 4 Speed idle Test (Data Sheet)
28) Quality Control Audit of: Loaded Two Mode (Data Sheet)
29) Quality Control Audit of: Computer Input and Output
30) Data Packet Enclosure Test

COMMENTS TO BE RESOLVED

	Comments	Comments Resolved	QC Review	OK
S. Gearhart				
B. Martinez				
C. Jackel				
B. GILMORE				
L.HERNANDEZ				
R. Martinez				
C. Vantassel				
R. Bellows				
R. Schneberger				

QUALITY CONTROL AUDIT OF:

NON-EVAPORATIVE HOT LA-4 PRECONDITION CHECK LIST

	Yes	No	Contact	Comments	Comments Resolved
1) Test Number					
2) Vehicle Number					
3) Date					
4) Dyno Code					
5) Time					
6) I.W. Correct?					
7) I.H.P. Correct?					
8) Correct Fuel Type Used?					
9) Correct Fuel Tank Capacity Entered?					
10) Correct Amount of Fuel Put In Tank?					
11) Fuel Temp Less Than 86°F					
12) Are Items 1 - 8 Completed Properly?					
13) Correct Time Entered for Last Dyno Use?					
14) Are Items 9 - 16 Completed Properly?					
15) Is Test Area Temp Between 68°F and 86°F?					
16) Are Items 17 - 20 Completed Properly?					
17) Is IHP From Digital Display within ± .2 of the Value Determined During Calibration?					
18) Time at End of Precondition (S.O.S.)					
19) Items 21 - 28 Completed Properly?					
20) Is Soak Area Temp Between 68°F and 86°F?					
21) Driver's Signature Entered?					
22) QC Signature Entered?					

QUALITY CONTROL AUDIT OF:
PRECONDITION TRACE

	Yes	No	Contact	Comments	Comments Resolved
1) Vehicle Number					
2) Test Number					
3) Dyno Number					
4) Date					
5) Time					
6) Time Less than 2 Hours After Dyno Warm Up?					
7) I.W. Correct?					
8) I.H.P. Correct?					
9) 50 MPH Entered Adjacent to I.H.P.					
10) 50 MPH Cal. Check on Trace?					
11) Driver's Signature on Trace?					
12) Trace OK?					
13) Q.C. Signature Entered?					

QUALITY CONTROL AUDIT OF:
DYNAMOMETER WARM-UP CHECK LIST

Part "A"	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Dyno Code					
3) Test Number					
4) Car Number					
5) Start Time					
6) Vehicle Make Entered?					
7) Vehicle Model Entered?					
8) I.H.P. Correct?					
9) I.W. Correct?					
10) Tech. Name Entered?					
11) Items 1-14 Properly Completed?					
Part "B"					
12) Item 1 Completed?					
13) Is applied Inertia Weight correct?					
14) Items 3-6 Completed Properly?					
15) Stop Time from Item 6					
16) Items 7-11 Completed Properly?					
17) Driver's Signature Entered?					
18) Date Entered?					
19) Time Entered?					
20) QC Signature Entered?					

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
DRIVER'S FTP CHECK LIST

	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Test Number					
3) Vehicle Number					
4) Dyno Number					
5) Driver's Name Entered?					
6) I.W. Correct?					
7) I.H.P. Correct?					
8) Time at Beginning of 12 Hour Soak (SOS)					
9) Is Above Time Same as End of Precondition?					
10) Time at Start of Test?					
11) Is SOT 12-24 Hours Later Than SOS?					
12) Is Calculated Soak Time Correct?					
13) Time at Which Dyno Was Last Used?					
14) Are Items 1-7 Properly Completed?					
15) Were Vehicle Tires at Approx. 45 PSI for Test?					
16) Are Items 8-16 Properly Completed?					
17) Do Sling and Strip Chart Agree Within 1.8^{o}F?					
18) Are Items 17-26 Properly Completed?					
19) Starting Conditions Properly Noted?					
20) Are Items 27-41 Properly Completed?					
21) Driver's Signature Entered?					
22) QC Signature Entered?					

QUALITY CONTROL AUDIT OF:
WB/DB CHART (EPA Sequence)

	Yes	No	Contact	Comments	Comments Resolved
1) Vehicle Number					
2) Test Number					
3) Date					
4) Time Entered?					
5) Driver's Name or Initial's Entered?					
6) SOP 1 Marked?					
7) SOP 2 Marked?					
8) Hot Soak Marked?					
9) SOP 3 Marked?					
10) EOT Marked?					
11) DB Temp. 68^{o}F to 86^{o}F?					
3 MIN. BAGGED IDLE					
12) SOT Marked?					
13) EOT Marked?					
14) DB Temp 60^{o}F to 86^{o}F?					
50 CRUISE TEST					
15) SOT Marked?					
16) EOT Marked?					
17) DB Temp. 68^{o}F to 86^{o}F?					
HFET					
18) SOT Marked?					
19) EOT Marked?					
20) DB Temp 68^{o}F to 86^{o}F?					
4 SPEED IDLE					
21) SOT Marked?					
22) SOT Marked?					
23) DB Temp 68^{o}F to 86^{o}F?					
LOADED 2 MODE					
24) SOT Marked?					
25) EOT Marked?					
26) DB Temp. 68^{o}F to 86^{o}F?					
Q.C. SIGNATURE ENTERED?					

QUALITY CONTROL AUDIT OF:
FTP DRIVER'S TRACE

	Yes	No	Contact	Comments	Comments Resolved
1) Vehicle Number					
2) Test Number					
3) Dyno Number					
4) Date					
5) Time					
6) Driver's Signature on Trace					
7) I.W. Correct?					
8) I.H.P. Correct?					
9) 50 MPH Entered Adjacent to I.H.P.?					
10) 50 MPH Calibration at Beginning of Trace?					
11) Trace OK?					
12) Driving Abnormalities Noted?					
13) 50 MPH Speed Check at End of Trace?					
14) Is I.H.P. Within ± 0.5 HP of Original Setting?					
15) QC Signature Entered?					

QUALITY CONTROL AUDIT OF:
CO/CO_2 INSTRUMENT TRACES

	Phase 1		Phase 2		Phase 3		Contact	Comments	Comments Resolved
	Yes	No	Yes	No	Yes	No			
1) Vehicle Number									
2) Test Number									
3) Date									
4) Time Entered?									
5) Signature Entered?									
6) Chart Speed Entered?									
7) CO Span OK? (Low Range)									
8) CO_2 Span OK? (Low Range)									
9) Zero OK?									
10) CO Span OK?									
11) CO_2 Span OK?									
12) Zero OK?									
13) CO Sample OK?									
14) CO Range?									
15) CO Deflection?									
16) CO_2 Sample OK?									
17) CO_2 Range?									
18) CO_2 Deflection?									
19) Ambient CO Trace OK?									
20) Ambient CO Deflection?									
21) Ambient CO OK?									
22) Ambient CO_2 Trace OK?									
23) Ambient CO_2 Deflection?									
24) Zero OK?									
25) CO Span OK?									
26) CO_2 Span OK?									
27) Zero OK?									
28) Repeat Steps 9 - 27									
29) All Operator Errors Marked?									
30) QC Signature Entered?									

DATA FORM NO:__________

QUALITY CONTROL AUDIT OF:
CO/CO$_2$ INSTRUMENT TRACES:
(Bagged Idle Test)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero OK?					
2) CO Span OK?					
3) CO$_2$ Span OK?					
4) Zero OK?					
5) CO Sample OK?					
6) CO Range ?					
7) CO Deflection?					
8) CO$_2$ Sample OK?					
9) CO$_2$ Range?					
10) CO$_2$ Deflection?					
11) Ambient CO OK?					
12) Ambient CO Deflection?					
13) Ambient CO$_2$ OK?					
14) Ambient CO$_2$ Deflection?					
15) Zero OK?					
16) CO Span OK?					
17) CO$_2$ Span OK?					
18) Zero OK?					
19) ALL OPERATOR ERRORS MARKED?					
20) Q.C. SIGNATURE ENTERED?					

QUALITY CONTROL AUDIT OF:
HC/NO$_x$ INSTRUMENT TRACES

	Phase 1		Phase 2		Phase 3		Contact	Comments	Comments Resolved
	Yes	No	Yes	No	Yes	No			
1) Vehicle Number									
2) Test Number									
3) Date									
4) Time Entered?									
5) Signature Entered?									
6) Chart Speed Entered?									
7) HC Span OK (Low Range)?									
8) NO$_x$ Span OK (Low Range)?									
9) Zero OK?									
10) HC Span OK?									
11) NO$_x$ Span OK?									
12) Zero OK?									
13) HC Sample OK?									
14) HC Range									
15) HC Deflection									
16) NO$_x$ Sample OK?									
17) NO$_x$ Range									
18) NO$_x$ Deflection									
19) Ambient HC Trace OK?									
20) Ambient HC Deflection									
21) Ambient HC OK?									
22) Ambient NO$_x$ Trace OK?									
23) Ambient NO$_x$ Deflection									
24) Zero OK?									
25) HC Span OK?									
26) NO$_x$ Span OK?									
27) Zero OK?									
28) Repeat Steps 9-27									
29) All Operator Errors Marked?									
30) QC Signature Entered?									

DATA FORM NO.________

QUALITY CONTROL AUDIT OF:
NO INSTRUMENT TRACES:
(50 Cruise Test)

	30 Second Sample		Contact	Comments	Comments Resolved
1) Zero?					
2) NO Span OK?					
3) Zero OK?					
4) NO Sample OK?					
5) NO Range					
6) NO Deflection					
7) Zero OK?					
8) NO Span OK?					
9) Zero OK?					
10) All Operator Errors Marked?					
11) Q.C. Signature Entered?					

DATA FORM NO:__________

QUALITY CONTROL AUDIT OF:
HC/NO_x INSTRUMENT TRACES:
(Bagged Idle Test)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero?					
2) HC Span OK?					
3) NO_x Span OK?					
4) Zero OK?					
5) HC Sample OK?					
6) HC Range?					
7) HC Deflection?					
8) NO_x Sample OK?					
9) NO_x Range?					
10) NO_x Deflection?					
11) Ambient HC OK?					
12) Ambient HC Deflection?					
13) Ambient NO_x OK?					
14) Ambient NO_x Defletion?					
15) Zero OK?					
16) HC Span OK?					
17) NO_x Span OK?					
18) Zero OK?					
19) All Operator Errors Marked?					
20) Q.C. Signature Entered?					

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
HC/NO_x INSTRUMENT TRACES:
(Highway Fuel Economy)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero?					
2) HC Span OK?					
3) NO_x Span OK?					
4) Zero OK?					
5) HC Sample OK?					
6) HC Range?					
7) HC Deflection?					
8) NO_x Sample OK?					
9) NO_x Range?					
10) NO_x Deflection?					
11) Ambient HC OK?					
12) Ambient HC Deflection?					
13) Ambient NO_x OK?					
14) Ambient NO_x Defletion?					
15) Zero OK?					
16) HC Span OK?					
17) NO_x Span OK?					
18) Zero OK?					
19) All Operator Errors Marked?					
20) Q.C. Signature Entered?					

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
CO/CO_2 INSTRUMENT TRACES:
(Highway Fuel Economy)

	Yes	No	Contact	Comments	Comments Resolved
1) Zero OK?					
2) CO Span OK?					
3) CO_2 Span OK?					
4) Zero OK?					
5) CO Sample OK?					
6) CO Range ?					
7) CO Deflection?					
8) CO_2 Sample OK?					
9) CO_2 Range?					
10) CO_2 Deflection?					
11) Ambient CO OK?					
12) Ambient CO Deflection?					
13) Ambient CO_2 OK?					
14) Ambient CO_2 Deflection?					
15) Zero OK?					
16) CO Span OK?					
17) CO_2 Span OK?					
18) Zero OK?					
19) ALL OPERATOR ERRORS MARKED?					
20) Q.C. SIGNATURE ENTERED?					

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
NO INSTRUMENT TRACE:
LOADED TWO MODE

	30 mph 19.0 APH		Basic Idle Trans. In Neut		Contact	Comments	Comments Resolved
1) Zero OK?							
2) NO Span OK?							
3) Zero OK?							
4) NO Sample OK?							
5) No Range							
6) NO Deflection							
7) Zero OK?							
8) NO Span OK?							
9) Zero OK?							
10) Repeat Steps							
11) All Operator Errors Marked?							
12) Q.C. Signature Entered?							

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
NO INSTRUMENT TRACE:
(4 Speed Idle Test)

	Basic Idle In Neutral		Idle At 2500 rpm		Basic Idle In Neutral		Basic Idle In Drive *		Contacts/ Comments	Comments Resolved
	Yes	No	Yes	No	Yes	No	Yes	No		
1) Zero?										
2) NO Span OK?										
3) Zero OK?										
4) NO Sample OK?										
5) NO Range										
6) NO Deflection										
7) Zero OK?										
8) NO Span OK?										
9) Zero OK?										
10) Repeat Steps										
11) All Operator Errors Marked?										
12) Q.C. Signature Entered?										

* Does not apply with manual transmission

DATA FORM NO.________

QUALITY CONTROL AUDIT OF:
CO/CO2 INSTRUMENT TRACES:
(4 Speed Idle Test)

	Basic Idle In Neutral		Idle At 2500 rpm		Basic Idle In Neutral		Basic Idle In Drive*		Contacts/ Comments	Comments Resolved
	Yes	No	Yes	No	Yes	No	Yes	No		
1) Zero?										
2) CO Span OK?										
3) CO_2 Span OK?										
4) Zero OK?										
5) CO Sample OK?										
6) CO Range?										
7) CO Deflection?										
8) CO_2 Sample OK?										
9) CO_2 Range?										
10) CO_2 Deflection?										
11) Zero OK?										
12) CO Span OK?										
13) CO_2 Span OK?										
14) Zero OK?										
15) Repeat Steps 6 - 10										
16) All Operator Errors Marked?										
17) Q.C. Signature Entered?										

* Does not apply with manual transmission.

DATA FORM NO.________

QUALITY CONTROL AUDIT OF:
CO/CO2 INSTRUMENT TRACES:
(50 Cruise Test)

	30 Second Sample	Contact	Comments	Comments Resolved
1) Zero?				
2) CO Span OK?				
3) CO_2 Span OK?				
4) Zero OK?				
5) CO Sample OK?				
6) CO Range				
7) CO Deflection				
8) CO_2 Sample OK?				
9) CO_2 Range				
10) CO_2 Deflection				
11) Zero OK?				
12) CO Span OK?				
13) CO_2 Span OK?				
14) Zero OK?				
15) All Operator Errors Marked?				
16) Q.C. Signature Entered?				

Data Form No.__________

QUALITY CONTROL AUDIT OF:
HEXANE INSTRUMENT TRACE:
(50 Cruise Test)

	30 Second Sample	Contact	Comments	Comments Resolved
1) Zero OK?				
2) Hexane Span OK?				
3) Zero OK?				
4) Hexane Sample OK?				
5) Hexane Range (ppm)				
6) Hexane Deflection				
7) Zero OK?				
8) Hexane Span OK?				
9) Zero OK?				
10) All Operator Errors Marked?				
11) Q.C. Signature Entered?				

QUALITY CONTROL AUDIT OF:
HEXANE INSTRUMENT TRACE:
(4 Speed Idle Test)

	Basic Idle In Neutral		Idle At 2500 rpm		Basic Idle In Neutral		Basic Idle In Drive*		Contacts/ Comments	Comments Resolved
	Yes	No	Yes	No	Yes	No	Yes	No		
1) Zero?										
2) Hexane Span OK?										
3) Zero OK?										
4) Hexane Sample OK?										
5) Hexane Range (p.p.m.)										
6) Hexane Deflection										
7) Zero OK?										
8) Hexane Span OK?										
9) Zero OK?										
10) Repeat Steps										
11) All Operator Errors Marked?										
12) Q.C. Signature Entered?										

* Does not apply with manual transmission

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
CO/CO_2 INSTRUMENT TRACES
LOADED TWO MODE

	30 mph 19.0 AHP	Basic Idle Trans. In Neut	Contact	Comments	Comments Resolved
1) Zero OK?					
2) CO Span OK?					
3) CO_2 Span OK?					
4) Zero OK?					
5) CO Sample OK?					
6) CO Range					
7) CO Deflection					
8) CO_2 Sample OK?					
9) CO_2 Range					
10) CO_2 Deflection					
11) Zero OK?					
12) CO Span OK?					
13) CO_2 Span OK?					
14) Zero OK?					
15) Repeat Steps 1-14					
16) All Operator errors marked?					
17) Q.C. Signature entered?					

DATA FORM NO.__________

Page 1 of 2

QUALITY CONTROL AUDIT OF: HEXANE INSTRUMENT TRACE: LOADED TWO MODE

	30 mph 19.0 APH	Basic Idle Trans. In Neut	Contact	Comments	Comments Resolved
1) Zero OK?					
2) Hexane Span OK?					
3) Zero OK?					
4) Hexane Sample OK?					
5) Hexane Range (PPm)					
6) Hexane Deflection					
7) Zero OK?					
8) Hexane Span OK?					
9) Zero OK?					
10) Repeat Steps					
11) All Operator Errors Marked?					
12) Q.C. Signature Entered?					

QUALITY CONTROL AUDIT OF:

CVS-CFV TEST DATA SHEET

	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Test Number					
3) Vehicle Number					
4) Odometer					
5) I.W. Correct?					
6) Thumb Wheel Correct?					
7) Barometric Pressure Reasonable (28.5 to 30 in. Hg.)					
8) Barometric Temp. Reasonable?					
9) Dry Bulb Temp. Correct?					
10) Wet Bulb Temp. Correct?					
11) Roll Revs. Entered Correctly?					
12)					
13) VMIX 1 Reasonable?					
14) VMIX 2 Reasonable?					
15) VMIX 3 Reasonable?					
16) Time at SOP 1?					
17) Is SOP 1 Within Two Hours of Warm Up?					
18) Time at EOP 1?					
19) EOP 1 = SOP 2?					
20) SOP 2 - SOP 1 = +8.5 ± 0.5 Minutes?					
21) EOP 2 - SOP 2 = +14.5 ± 0.5 Minutes?					
22) SOP 3 - EOP 2 = 10 ± 1 Min.?					
23) EOP 3 - SOP 3 = +8.5 ± 0.5 Minutes?					
24) ET 1 = 505 ± 4 sec. + Stall Seconds?					
25) ET 2 = 867 ± 4 Seconds?					
26) ET 3 = 505 ± 4 Seconds + Stall?					

Page 2 of 2

QUALITY CONTROL AUDIT OF:

CVS-CFV TEST DATA SHEET (CONTINUED)

	Yes	No	Contact	Comments	Comments Resolved
27) Ranges Correct for CO?					
28) Ranges Correct for CO_2?					
29) Deflections for CO Read Correctly?					
30) Deflections for CO_2 Read Correctly?					
31) Concentrations Correct for CO?					
32) Concentrations Correct for CO_2?					
33) Ranges Correct for HC?					
34) Ranges Correct for NO_x?					
35) Deflections for HC Read Correctly?					
36) Deflections for NO_x Read Correctly?					
37) Concentrations Correct for HC?					
38) Concentrations Correct for NO_x?					
39) EOA Less Than or Equal To EOP 1 + 20 Minutes?					
40) EOA 2 Less Than or Equal to EOP 2 + 20 Minutes?					
41) EOA 3 Less Than or Equal to EOP 3 + 20 Minutes?					
42) Does Comment Imply Test Is OK?					
43) Operator's Signature Entered?					
44) QC Signature Entered?					

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:

BAGGED IDLE TEST

	Yes	No	Contact	Comments	Comments Resolved
1) Transmission in proper gear?					
2) Time at START OF TEST?					
3) Time at END OF TEST?					
4) Elapsed Time?					
5) Is Total Test Time 3 min. ± (30 sec.)					
6) Barometric Press. reasonable? (28.5 to 30 in.hg.)					
7) Barometric Temp. reasonable?					
8) (VIMX) reasonable?					
9) Dry bulb correct?					
10) Wet bulb correct?					
11) Ranges correct for CO?					
12) Ranges correct for CO_2?					
13) Deflections for CO read correctly?					
14) Deflections for CO_2 read correctly?					
15) Concentrations correct for CO?					
16) Concentrations correct for CO_2?					
17) Ranges correct for HC?					
18) Ranges correct for NO_x?					
19) Deflections for HC read correctly?					
20) Deflections for NO_x read correctly?					
21) Concentrations correct for HC?					
22) Concentrations correct for NO_x?					
23) EOA Less Than 20 min. From End Of Sample?					
24) Does Comment Imply Test is OK?					
25) Operator's Signature Entered?					
26) Q.C. Signature Entered?					

DATA FORM NO.________

QUALITY CONTROL AUDIT OF:
50 CRUISE TEST DATA SHEET

	Yes	No	Contact	Comments	Comments Resolved
1) Test Start Time:					
2) Test End Time:					
3) End of Sample Equal 30 Seconds:					
4) Barometric Press. reasonable 28.5 to 30 In.Hg.?					
5) Barometric Temp. reasonable?					
6) Dry Bulb Temp. correct?					
7) Wet Bulb Temp. correct?					
8) Ranges correct for CO?					
9) Ranges correct for CO_2?					
10) Deflections for CO read correctly?					
11) Deflections for CO_2 read correctly?					
12) Concentrations correct for CO?					
13) Concentrations correct for CO_2?					
14) Ranges correct for HC?					
15) Ranges correct for NO ?					
16) Deflections for HC read correctly?					
17) Deflections for NO read correctly?					
18) Concentrations correct for HC?					
19) Concentrations correct for NO ?					
20) Does comment imply test is OK?					
21) Operator's Signature Entered?					
22) Is R.P.M. reasonable?					
23) Q.C. Signature Entered?					

DATA FORM NO.________

QUALITY CONTROL AUDIT OF:
HIGHWAY FUEL ECONOMY DATA SHEET

	Yes	No	Contact	Comments	Comments Resolved
1) TEST START TIME:					
2) TEST END TIME:					
3) Is ELAPSED TIME 12.45 min. (± .5 min.)?					
4) Barometric Press. reasonable (28.5 to 30 in.hg.)?					
5) Barometric Temp.reasonable?					
6) Dry bulb Temp. correct?					
7) Wet bulb Temp. correct?					
8) VMIX reasonable?					
9) Roll Revs. correct?					
10) Ranges correct for CO?					
11) Ranges correct for CO_2?					
12) Deflections for CO read correctly?					
13) Deflections for CO_2 read correctly?					
14) Concentrations correct for CO?					
15) Concentrations correct for CO_2?					
16) Ranges correct for HC?					
17) Ranges correct for NO_x?					
18) Deflections for HC read correctly?					
19) Deflections for NO_x read correctly?					
20) Concentrations correct for HC?					
21) Concentrations correct for NO_x?					
22) EOA less than or equal to 20 min.?					
23) Does comment imply test is OK?					
24) Operator's signature entered?					
25) Q.C. Signature entered?					

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
4 SPEED IDLE TEST (Data Sheet)

	Yes	No	Contact	Comments	Comments Resolved
1) TEST START TIME:					
2) TEST END TIME:					
3) ELAPSED TIME:					
4) Barometric Press. reasonable (28.5 to 30 in.hg.)?					
5) Dry bulb Temp. correct?					
6) Wet Bulb Temp. correct?					
7) Ranges correct for CO?					
8) Ranges correct for CO_2?					
9) Deflections for CO read correctly?					
10) Deflections for CO_2 read correctly?					
11) Concentrations correct for CO?					
12) Concentrations correct for CO_2?					
13) Ranges correct for HC?					
14) Ranges correct for NO ?					
15) Deflections for HC read correctly?					
16) Deflections for NO read correctly?					
17) Concentrations correct for HC?					
18) Concentrations correct for NO ?					
19) Is R.P.M. reasonable?					
20) Does comment imply test is OK?					
21) Operator's Signature entered?					
22) Q.C. Signature entered?					

DATA FORM NO.__________

QUALITY CONTROL AUDIT OF:
LOADED TWO MODE (Data Sheet)

	Yes	No	Contact	Comments	Comments Resolved
1) TEST START TIME:					
2) TEST END TIME:					
3) ELAPSED TIME:					
4) Barometric Press. reasonable 28.5 to 30 in.hg.?					
5) Barometric Temp. reasonable?					
6) Dry bulb Temp. correct?					
7) Wet bulb Temp. correct?					
8) Is the I.W. 1000 lbs.?					
9) Is the I.H.P. correct?					
10) Ranges correct for CO?					
11) Ranges correct for CO_2?					
12) Deflections for CO read correctly?					
13) Deflections for CO_2 read correctly?					
14) Concentrations correct for CO?					
15) Concentrations correc for CO_2?					
16) Ranges correct for HC?					
17) Ranges correct for NO_x?					
18) Deflections for HC read correctly?					
19) Deflections for NO_x read correctly?					
20) Concentrations correct for HC?					
21) Concentrations correct for NO_x?					
22) Does comment imply test is OK?					
23) Operator's Signature entered?					
24) Is R.P.M. reasonable?					
25) Q.C. Signature Entered?					

QUALITY CONTROL AUDIT OF:

COMPUTER INPUT AND OUTPUT

	Yes	No	Contact	Comments	Comments Resolved
1) Date					
2) Vehicle Number					
3) Test Number					
4) Roll Revs. Entered Correctly					
5) If 1977 Year Model, Were STD Roll Revs. Used					
6) BO Entered Correctly?					
7) BT Entered Correctly?					
8) DB Temp Correct?					
9) WB Temp Correct?					
10) VMIX Correct?					
11)					
12) Meter Reading Correct?					
13) Concentration Values Correct?					
14) QC Signature Entered?					

DATA PACKET ENCLOSURE LIST
EPA Contract No. 68-03-3024

To be submitted with each Data Packet.

I. Emissions Testing Data

________ Precondition Check List
________ Precondition Trace
________ Test Drivers Check List Pages 1 through 7
________ FTP Trace
________ Vehicle Refueling Records
________ Bench Operator Data Forms Pages 1 through 7
________ WB/DB Trace
________ Soak Area Trace
________ Analytical Traces
________ CVS Print-Out
________ Quality Audit Work Sheets
________ Vehicle Driveability Report
________ Highway Fuel Economy Print-Out
________ Bagged Idle Print-Out
________ Test Validity Statement

II. Procurement Data

________ Telephone Survey (3024.2)
________ Incoming Inspection Form (3024.8)
________ Test Agreement (3024.1)
________ Test Agreement Addendum (3024.3)
________ Standard Vehicle Loan Agreement (3024.4)
________ Savings Bond Information Sheet (3024.6)
________ Vehicle Owner Questionnaire Data Sheet
________ Supplemental Owners Survey
________ Loaner Vehicle Log (3024.7)
________ Mechanics Inspection Form (3024.9)
________ Vehicle Maintenance Log (3024.10)
________ EPA Data Pack
________ Vehicle Information Sheet (3024.12)
________ Post Test Inspection Form (3024.11)
________ Vehicle Release and Savings Bond Receipt (3024.5)
________ Procurement Check List (3024.13)

III. Supplied To Owner

________ Fuel Economy Kit
________ Contractor Information Filled In
________ Vehicle Fuel Fill In Information Recorded
________ Letter Of Appreciation
________ EPA Follow-up Letter and Envelope
________ Contractor Portion Fill In
________ Savings Bond
________ Vehicle Maintenance Log (3024.10)